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THE NATURE-STUDY REVIEW

Vol. 3, No. 1
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DEVOTED TO ALL PHASES OF NATURE-STUDY IN SCHOOLS

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THE
NATURE-STUDY REVIEW

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VOL. 3 JANUARY, 1907 NO. 1

THE ESTABLISHED PRINCIPLES OF NATURE-STUDY

BY MAURICE A. BIGELOW

Teachers College, Columbia University

[Read before the Section of Biology, of the New York State Science Teachers' Association, December 27, 1906.]

Some months ago one of the best known experts in the general field of elementary education asked me essentially these questions: "What principles of nature-study may be considered firmly established? When will the leaders in the nature-study movement begin to reach agreement so that we may have some definite guidance in our elementary schools and thus cease the apparently aimless groping in the dark?" These questions, coming as they did from such an authority on elementary education, deserve a most serious answer. And the seriousness of the problem is still greater to one who knows from the extensive correspondence connected with the editorial work of THE NATURE-STUDY REVIEW that just such questions are being asked wherever educators have had their attention attracted to nature-study. Everywhere there seems to be strong popular impression that each advocate of nature-study is a law unto himself and that in each region nature-study is quite distinct from all other places in the world because the local leader appears to have views which are opposed to those held by leaders elsewhere.

Is all this widespread impression really well founded? Is it true that nature-study as an educational movement is entirely disorganized and that after all the years of work we have made no decided progress? I feel certain that to these questions we can give an emphatic negative answer, and so I invite your attention to some facts which point to the conclusion that on some most important principles—in fact the very foundations of nature-study—there is agreement on the part

of all educators and men of science who are now giving close attention to the progress of the nature-study movement.

It will help our discussion if in advance we recognize that principles of nature-study may be agreed upon before they are in universal practice. Very much of the pioneer practice in nature-study has been without any suggestion of principles, and helpless teachers have been turned adrift with only the admonition to "teach nature." The result is that there is still a deplorable amount of unorganized practice in nature-study. It was to this that I referred in a recent editorial note in THE NATURE-STUDY REVIEW in which I wrote that "nature-study is still far from being firmly established in our school system." Let me here emphasize the explanation that *practice and not principles* was meant, for I believe that so far as nature-study appears to be firmly established locally it rests upon foundation principles concerning which there is no longer any serious dispute. To some consideration of these established principles we now turn.

First, because most important, we have reached agreement in answer to the question, "*What is nature-study?*" For years and years this has been the center of all disagreements; but in carefully reviewing all the literature, and especially the best practice of the past two or three years, I fail to find even the shadow of disagreement concerning the working definition of nature-study. Interpreting in my own words what I see in all the present tendencies of nature-study as an educational movement, I must define nature-study as follows: Nature-study is primarily the simple observational study of common natural objects and processes for the sake of personal acquaintance with the things which appeal to human interest directly.

Now before I have completed reading this sentence I am sure that some of my hearers are preparing to object that Professor Hodge does not so define nature-study and that Professor Bailey has said something different,—and so on through a list of contributors to the nature-study discussions of the past. But reserve decision and let us analyze.

Professor Hodge has defined nature-study as: "Learning the things in nature that are best worth knowing, to the end of doing those things which make life most worth living." Read his "Nature Study and Life" and talk with Professor Hodge and you will find (1) that by "things best worth knowing" he means the common things

which touch our every-day life and (2) that simple observational study is his one approved method of learning these best things. Wherein does the author of "Nature Study and Life" not agree with any essential of the summarizing definition above?

Professor Bailey has not attempted to write a one-sentence definition of nature-study; but we can make one for him by placing together phrases selected from his "Nature-Study Idea." Here are his words placed together from two or three paragraphs: Nature-study is the direct observational study of common things in the child's environment for the purpose of training the eye and the mind to see and to comprehend and thus to gain a sympathetic attitude towards nature for the purpose of increasing the joy of living. Notice that Professors Bailey and Hodge agree on the essential points, namely, observational study of common things, and for the sake of influencing our every-day attitude toward nature.

If time permitted, I would quote from many other writers on nature-study whose views I have carefully considered in this comparative study. Putting together all direct statements and suggestions for practice, I find among the writers now prominently identified with nature-study as an educational movement no one whose idea of nature-study does not involve the following points as essentials: (1) direct observational study (2) common things of nature (3) from the standpoint of our human interests in nature as it touches our daily life directly. This is what we now mean in theory by nature-study, and practice is tending rapidly towards complete conformity with the definition.

The second established principle is that *nature-study should be differentiated from science.* The strong tendency of recent years is to reserve the word science for strictly organized knowledge. We no longer properly say that a student is studying the science of botany because we have seen him picking flowers by the wayside, or engaged in pressing and mounting fifty specimens. All this is a valuable preliminary to real botany; but botany study should be strictly science study—a study of the morphological, physiological, embryological, paleontological and ecological principles or generalizations, around which the facts concerning plants are grouped into a unified and classified mass of knowledge. Likewise in all the other sciences we have come to regard science as dealing primarily with principles. Now nothing could be more beyond possible dispute than that children need facts and not principles drawn from

grouped facts. Hence we have at last united in recognizing that true science even stated in words of one syllable is not for children, because for them we have something better in nature-study. I may summarize the distinction between nature-study and science as now held by the most active workers in nature-study as follows: "Nature-study is primarily the simple observational study of common natural objects and processes for the sake of personal acquaintance with the things which appeal to human interest directly and independently of relations to organized science. Natural-science study is the close analytical and synthetical study of natural objects and processes primarily for the sake of obtaining knowledge of the general principles which constitute the foundations of modern science."[1] Along this line nature-study for the elementary schools is being rapidly differentiated from the true science of high schools and colleges.

Parenthetically let me remark that we must not forget that some nature-study is still necessary in most high schools and even in colleges, because the students have not had it in the lower school. However, nature-study in high school or college is not science in the strict sense. It is simply nature-study supplementary to and preparatory to the real science which deserves much attention in high schools and colleges.

Another point which we must not overlook is that there can be no sharply defined line between nature-study and science so far as practice in our school system in its entirety is concerned. In the upper grades and first year of the high school the nature-study will gradually lead the way into more and more advanced study approaching the real science lessons designed to point directly to the great generalizations of science. However, the line can be drawn sharply enough for all practical purposes and there is no longer any sufficient excuse for duplicating the work already well done as science. For example, what advantage can we possibly claim for the books on "physical science for grammar grades" and certain books of botany and zoölogy which are said to be "adapted to grammar grades." All these are complete duplications of existing high-school work. There are plenty of things to be done in the elementary school without attempting to anticipate directly the proper work of the secondary school; and the modern teacher of nature-study who hopes for success in the future must study to keep her nature-study as far as pos-

[1]From this journal Vol. I, p. 17, Jan., 1905.

sible from the somewhat formal laboratory method of the upper school and more in direct touch with the great nature out-of-doors. We want our pupils to get from nature-study something of that naturalist's outlook which Gilbert White found in the fields of Selborne, which Thoreau found at Walden Pond, and which John Burroughs stills finds at Riverby. To this end we need to study the possible differentiation between nature-study and science. If we can get the mass of teachers to see the difference, there will be an end to science reduced to words of one syllable, and teachers will not close the first lesson in physical nature-study with these words quoted from a book for grammar schools: "We have now learned that matter is that which occupies space, that it is made up of atoms and molecules, and that there are spaces between the molecules." The atomic theory, laws of conservation of energy and indestructibility of matter, theories of ether motion, Newton's laws, the periodic law of the elements, chemical equations, and on the biological side the great central theory of organic evolution—these are examples of the great ideas of modern science at which we aim directly in the higher schools, but certainly they are not the proper educational food for children of the elementary school. Real nature-study must be more sharply differentiated from true science, and attempt to pave the way rather than imitate and duplicate the science of the higher schools.

The third principle on which I see general agreement is the statement of *aims and values of nature-study*. As to values, we recognize that they are in *discipline* and *information;* discipline in habits of thoughtful observing, and information which has æsthetic, moral, practical and intellectual influence in the every-day life of the average individual. To develop these values we are guiding our teaching by certain definite aims; and interpreting in my own words the predominating tendency of the present time, I must say that we have agreed that *in essentials* the great aims are as follows: (a) To give general acquaintance with and interest in common objects and processes in nature. (b) To give the first training in accurate observing as means of gaining knowledge direct from nature, and also in the simplest comparing, classifying and judging values of facts; in other words, to give the first training in the simplest processes of the scientific method. (c) To give pupils useful knowledge concerning natural objects and processes as they directly affect human life and interests.

The fourth principle of nature-study: There is quite general agree-

ment that there is *one fundamental method* of teaching nature-study and that consists in getting the pupil *to see and think for himself*. Upon this depend two of the three aims above stated, the aim for sympathetic acquaintance and the aim for training in thoughtful observing. Books and lectures can not suffice for these, as possibly they might for giving useful information. There will, I think, be found little dissent from the proposition that *true nature-study can not be primarily book study*. Rather should nature-study aim to make the pupil learn to study nature in the absence of books, thus preparing for the usual condition in our every-day life.

The fifth principle refers to selection of materials for study. On this I see general agreement for the proposition that we should first of all *select the most common and the most interesting from the viewpoint of every-day life*. The general application of this principle is responsible for much of the apparent lack of uniformity in courses of nature-study. The geographical distribution of natural things is highly variable and hence the selection of common things for nature-study must vary. However, this is of no great significance, for if nature-study be guided by the principles already discussed the educational result will be the same whether the materials selected be the common ones available in a Maine forest or those in a Dakota wheat field.

There is one other fundamental principle which is so important that it deserves statement more emphatic than that incidentally suggested in a preceding paragraph. I refer to *nature-study for the child* as contrasted with nature-study for adult minds. We must recognize the established principles of child-study in all our nature-study for elementary education. To the general recognition of this great principle we owe the comparatively recent decided advance in differentiating between nature-study for elementary schools and science study for higher schools.

Summarizing, I have pointed out that there is now great agreement on the following fundamental points:– (1)the working definition of nature-study (2) differentiation from science in the strict sense (3) aims of nature-study for elementary education (4) the observational method is fundamental (5) principle governing selection of materials for study (6) dependence of nature-study on child-study. (The order of statement is quite unimportant, for these are principles which must stand or fall together).

These, I believe, are the established guide-posts which definitely

mark the pathway of educational nature-study. Progress or retrogression in the future will depend upon our application in practice of these established principles in theory. We have now reached agreement upon the working theory of nature-study, the way is clearly defined, and the time has come for concerted action in practice. It is a serious question whether nature-study is ever to be firmly established and generally recognized as a integral part of the elementary-school course of study in all schools; but the final answer will depend directly upon future application of the principles now agreed upon. And in turn the success in practice will depend upon the training of the teachers. It is a very significant and hopeful fact that wherever nature-study guided by the established principles is being presented by well-trained teachers it is now recognized as *an all-essential part of a rational and liberal elementary education.*

THE ESTABLISHED PRINCIPLES OF NATURE-STUDY[1]

BY C. F. HODGE

Clark University

'Tis a wise saw: "Where opinions differ, there lies a problem to be solved." In line with this idea I have always found encouragement rather than dismay in the multitude of opinions which cover the field of nature-study. They all bear testimony to the largeness and vitality of interests in this "problem of problems."

In the presence of such vital and momentous interests as those relations to nature which condition the life and welfare our eighty millions personal motives of every sort disappear completely; and I have always felt, and often said that I felt, most strongly attracted towards those who differed from me most violently. As long as divergent views are honestly expressed, we may hope to learn and progress toward the solution of our problem. Ideas, like species, must struggle in order to live and the fittest shall survive in the end.

I have been asked the questions that head our leading paper scores of times. I have always replied by saying: "The more views, the better. Choose the one that appears to you best supported by reason and common sense, and then put more common sense and reason of your own into it, and so help the good work along."

[1]Professor Hodge was unable to be present at the meeting when the preceding paper was read; but sent the following with which he had planned to open the discussion.

Those who cannot do this ask the questions because they are mentally too indolent to think for themselves and so do not count on either side. They might as well say in matters religious: "We won't do anything until God and the devil agree."

After all, as Carlyle says: "Doubt of whatever kind can be ended by action alone." General agreement will gradually take form out of the actual experience of all the teachers who are doing the work. If we can secure and print in THE NATURE-STUDY REVIEW during the year brief articles, possibly not more than a page or even a single paragraph, from actual teachers giving some first class bit of nature-study as they have done it themselves, such a symposium could not fail to give us data from which to derive principles by the inductive method. Let us hear from you, fellow teachers, by the scores and hundreds; and to you who settle our doubts by your works we shall all accord our highest appreciation and respect.

It is certainly not hard for me to say that I agree with all the principles advanced by Professor Bigelow. He has represented my own views with perfect fairness and I only hope Professor Bailey can say as much for his.

FIELD WORK IN BOTANY IN GRAMMAR AND HIGH SCHOOLS[1]

BY CHARLES E. BESSEY

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[EDITORIAL NOTE.—It has been pointed out several times in THE REVIEW (especially in Vol. 1, No. 2, p. 77) that nature-study may have a place in high schools, and even in colleges, when the elementary-school work has not been sufficient to give general familiarity with the very common things in nature; and so much of the field work in botany and zoölogy which has come into vogue in recent years is really nature-study rather than organized science study. The following paper will be especially helpful to high-school teachers who must (1) give their own pupils the essentials of plant nature-study and (2) direct the elementary school nature-study so that the coming botany classes in high school will bring from their nature-study the best kind of a foundation. And this without in the least aiming to make the elementary-school work directly preparatory to the high school, for that nature-study which is best for liberal elementary education considered as an end in itself will be perfectly satisfactory as a preparation for high-school sciences.]

Within the last few years there has been a strong tendency among teachers of botany to recommend a very considerable increase in the amount of field work to be undertaken by the pupils in this subject. This is a natural reaction from the unusual emphasis which had been placed upon laboratory work, especially that form of laboratory work which included the use of the compound microscope. Today there are those who would banish the compound microscope from the grade schools and some even who would greatly restrict its use in the high school. Some of these reactionists would go back to something very like the old-time teaching in which the pupil prepared to "analyze and classify" the flowering plants by first studying some special text-book for a few weeks, and then spending as much time as possible in collecting plants for the practical work of so-called "analysis and classification." It must be said for this old-time method that whatever were its deficiencies, it did make pupils acquainted with some of the wild plants of the region. It is true that the more difficult species were judiciously ignored, the pupil giving them no attention since they were said to be "too difficult for the beginner." On this point I can speak with authority, since I was taught my first

[1]Read before the Science Section of the Nebraska State Teachers' Association, December 27, 1906.

botany in this way and I well remember how we avoided most of the trees, ferns, and grasses, and all of the sedges. We felt that they were quite beyond our possibilities. Then too, we paid no attention whatever to the mosses, the liverworts, the fungi, the lichens, and all the swarm of freshwater algae,—those green growths that abound in the pools, ponds and brooks. But in spite of all this we learned a good deal about the plants of the fields, the thickets, the swamps and the forests, and in addition we knew where the plants grew that we had collected and studied.

With the coming in of the "laboratory idea" field work largely fell into disuse, if not disrepute. The pupil's material was brought to him from somewhere, possibly from a supply house hundreds of miles away. To the pupil such a specimen had no place in nature. He thought of it as occupying a bottle or a box in the laboratory, and not as a plant growing in some pond, field or forest. This was the laboratory idea carried to an extreme, and without doubt the pupil missed a good deal by not seeing plants in their natural habitats; and yet one must not overlook the fact that such a pupil knew some things that the earlier type of pupil did not. Thus the laboratory pupil could tell you about the spores of the mushrooms, and had a a pretty clear notion of how they serve to propagate these plants, while the old-time pupil paid no attention whatever to them. The laboratory trained pupil may not have collected mushrooms in the field, but he studied them in the laboratory, and when he found them in rambles in field or forest he was able to recognize them at once. Moreover, since he studied specimens that were supplied to him he was not dependent upon the chance finding of plants for his studies, and thus was able to take up the examinations of the different kinds in their proper sequence. He had thus another great advantage over his old-time predecessor in that he could begin with simple forms and pass regularly to those which are successively higher and higher. He thus quickly gained some idea of the general classification of plants, which he could not if compelled to depend upon his own efforts in the collection of material from the country about him.

From what I have already said it can be seen that I am not one of those who hold that field work is one of the absolutely essential things in all stages of the pupil's study. On the contrary I have long since realized that there is a time to do field work, and a time to refrain from doing it. In the words of Scripture "there is a time for all things," but it does not follow that we must always make time

for all things at once. No more are we called upon to have field work in every course in botany. In some courses it is an essential, but in others it is quite out of place.

I am here reminded of another subject—civil engineering—the practice of which becomes ultimately an out-of-door business. And yet in the training of the civil engineer it is not the habit of the professors to have field work in connection with every course. I have been watching from my study window a class of civil engineering students the past few months while they were engaged in field work, and to me it has been very evident that they were learning a good deal. Yet these young engineers have field work in only one of their courses. In the other courses they do not go out and put into practice in the field what they learn in the class-room, the draughting room, the laboratories and the shops. For certain courses this field work is essential, for others it is not. There is a time for all things, and everything must be done in its proper time. Let us not make the mistake of allowing some things to have more than their appropriate time. Let us not make the mistake of supposing that in botany all of the very considerable work done in the class-room and the laboratory are not valuable and necessary parts of botany. Let us not have such a distorted view of the matter as to consider field work to be the only work worthy of our attention. It is valuable, nay I will say that it is absolutely essential in its place, but this does not require us to give it more than its fair share of time.

With this general preliminary discussion, let me separate the subject so as to discuss, first, field work in the grade schools, and afterwards field work in the high schools. In this way I can make my position much plainer.

Let us first inquire as to the purpose of plant study in the grade schools. Why do we have these pupils take up the study of plants? Why do we teach the subject? The answer to these questions will prepare the way for the answer to the main question as to field work now under discussion. The purpose of such plant study (generally called nature-study) is to acquaint the pupil with the plants about him. The pupil is still too young to do much generalizing. He still deals largely with particulars. He thinks of particular plants, or particular kinds of plants. He is still adding to his knowledge of the kinds of things around him. This is the time for him to learn to recognize the different kinds of trees, the many different grasses, the considerable number of weeds, the mosses of many kinds, the

toadstools of different sizes, shapes and colors, as well as the many kinds of curious pond scums, and other inhabitants of the ponds and streams. The boys and girls of eight to twelve or fourteen years of age, if properly handled, are full of interest in regard to all of these forms of plant life. Here is the place where the book must be kept in the background and the work in the field put to the front. Here is the place for a great deal of field work. This is the time when field work should be emphasized. And yet I should not for a moment be understood as suggesting that the whole of the pupil's knowledge of plants should be limited to his own observations. We must remember that the pupil is young and immature, and moreover, that with all of the keenness of eye which he sometimes possesses, he is still in most cases only an ordinary boy who sees only a small part of what he might see were he older and better trained. So he must be led, and his knowledge must be supplemented by what other observers have seen. Thus if he has found a white pine in his rambles, have him collect his own observations into definite shape and then let him read a good account of it from some standard work like Sargent's "Manual of the Trees of North America." By this means his knowledge is considerably increased, and he has the opportunity of measuring his observations against those of men who have made a prolonged study of the subject. He is led moreover to connect his own observations and the knowledge he has acquired at first-hand with the knowledge recorded in the standard books. In such consultations of books he will find many references to things that he has not seen, and these will send him back again to find whether he can verify them for himself.

So I would have him become acquainted with all of the trees in his neighborhood. Let him study them and get all he can through his own observations, but let him supplement this with what he finds on record in a standard book. And among these standard books I should include a botanical manual or two of the region, such as Britton's "Manual of the Flora of the Northern States and Canada," or Gray's "Manual of the Botany of the Northern United States." Of course he will find some terms in the descriptions that he does not understand, but this can be made a means of enlarging his vocabulary, a matter of no small importance in the training of the young.

In like manner the grasses can be taken up with much profit, for it is a very poor region, indeed, where there are not as many as fifty

kinds of wild and cultivated grasses. Let the pupils scour the fields and the woodlands for different kinds of grasses, many of which can be identified by the pupil with the judicious help of the teacher, and here again the information given in the manual should be added to the pupil's meagre stock of first-hand knowledge. The mosses, toadstools, pond scums, and other well-marked types of plants may be the subject of the field work at the proper season, but in all cases I should consider that not all possible use had been made of them if the work stopped merely with the observations made by the pupil. These observations must be supplemented by reading what is said of these plants by the authors of standard books.

I should treat the other aspects of plant nature-study in a similar way. Suppose the grade pupil (eighth grade) to be engaged in studying the forms of flowers, he should combine the descriptive text with field work for the discovery of illustrations of this or that particular form. The forms of fruits and seeds, of leaves and stems, in fact of all parts of the plant, may be sought in the fields, and taken up in the class-room. In some cases the field work should precede the consultation of books, while in other cases it may well follow. The point is that the two must go hand in hand. In the pupil's earlier work I should place the emphasis upon the field work, but as the pupil advances in age and ability I should gradually place more emphasis upon the indoor work, which finally develops into full laboratory and library work, while the field work comes to have a secondary place.

This leads me quite naturally to high-school botany. Here, if the previous preparation has been something like what I have indicated above, there should be a beginning of intensive study of botany. It should not be necessary for the pupil to be taught to recognize the common trees, grasses and weeds at sight. Nor should it be difficult for the high-school pupil to recognize mosses, toadstools and pond scums when he sees them. All these and many more should be quite as familiar to the pupil as are the common animals—horses, cows, sheep, hogs, dogs, cats, birds, snakes, fishes, butterflies, bees, and mosquitoes.

He should not have to use precious time in learning to recognize these familiar things. These he should already know well enough so that when they are cited as illustrations it will not be necessary for him to search blindly for them, nor for his teachers to take him out on "botanizing trips" to show him where they are and what they

look like. This knowledge is something that the high schools have a right to demand of the pupils who come into them from the grade schools, just as we now demand that pupils entering the high-school must know the multiplication table. It is a waste of high school time to use it in learning such simple processes, and so it is with a familiarity with trees. It ought not to be necessary for the high-school teacher to spend time in field work in order to teach this part of botany. But just as when we find a pupil in high school who has not mastered the multiplication table he must set about mastering the subject, so it must be when the pupil's knowledge of trees, grasses, weeds, etc., is defective—this must be remedied by an adequate amount of field work. I have found it necessary, even in university classes, to remedy a defective knowledge of the common trees by giving a couple of months to their study in my classes in systematic botany. It is a use of valuable time that ought not to be necessary, since the whole matter should have been attended to much earlier in the student's experience.

The botany of the high school should be the systematic general survey of the vegetable kingdom, beginning with the simplest and most easily understood forms, and passing from these step by step through the intermediate forms to the highest. This can only be done by intensive laboratory work, in which the pupil makes out for himself as many of the structural details as is possible in the time allotted to him for the work. In such work the pupil should no more be sent out to get his own material than should the pupil in chemistry be expected to collect from the drug stores, the gas works, the factories, the rock piles, and the earth strata, the substances that he is to analyze in the chemical laboratory. In no general course in chemistry today is such a procedure allowed. There are special courses in chemistry in which this field work, as it may be called, is not only permissible, but highly desirable. And so it is in botany. In the general courses the pupil must have his material supplied to him in such quantities and at such times that he may make his studies in their right sequence and with no delay. This in brief should be the work of the pupil in high-school botany.

But what can the overworked teacher in the high school do for his pupils who need field work in order to familiarize them with plants as they grow in the fields, and woodlands? What kind of field work will repair this defect in the pupil's education? In other words, how shall the necessary field botany of the high school be conducted?

This is not a difficult question to answer in the case of the smaller high schools where the classes in botany number not more than twenty-five to thirty, for here the teacher can easily plan enjoyable and profitable Saturday trips with the whole class. Sometimes a trip of a couple of hours in the late afternoon may accomplish much, if the direction has been well chosen. It is essential that if the teacher undertakes this out-of-door class work he should know his ground thoroughly, so that his class may not be disappointed in the results. I warn all teachers who have never conducted classes in field botany that previous preparation is just as necessary here as it is in the work indoors.

For such work the class will need a number of tin collecting boxes of the regulation pattern, pocket-lenses for the closer examination of specimens, a number of plant-presses, and a supply of drying paper. In the field an abundance of specimens of many kinds of plants should be collected and examined with some care, then after they are brought back to the laboratory they must be put carefully into the presses, after proper labeling. Such field work, if made to include lower as well as higher plants, will be very helpful to those pupils who have never had any practice in it in the grades, and will go far towards remedying this defect in their education. In the hands of some teachers, those who love the out-of-doors life, such work may be made very enjoyable also, and much interest and enthusiasm may be aroused.

But when I am asked to suggest field work for the larger high schools, where the classes number from one hundred to two hundred, or even more, I have to confess that I do so with many misgivings. They are always in large towns or cities, and where the distance to the open country and the woodlands is several miles at the least. It is impossible, also, to care for such large numbers. To divide a class of two hundred into sections small enough to handle would require the whole time of several teachers, and of course that is out of the question. The fact is that the field work should have been done in the grade schools, where the classes are smaller, and it is not right that the high-school teacher should be asked to take it up. But if the teacher in the large high-school must include some field work, he should break up his class into as small sections as possible, and take these into the city parks, out into the country, and where possible into the natural woodlands. He should show his pupils how to collect in such trips, and he should then select some of the older and more trustworthy and helpful pupils of pre-

ceding classes to go as leaders of sections when he himself cannot go. In some such way as this the work may be done, and many a pupil will have the opportunity of learning much about the appearance and habits of wild plants with regard to which he previously knew little or nothing. But I cannot help feeling that the knowledge so gained in the high school is acquired through an extravagant waste of precious time which might have been much better employed if the elementary school had given the proper nature-study.

The results of this field work in the high school should be gathered up by each pupil into a collection of dried specimens for his own herbarium, properly mounted upon standard paper and properly named and labeled. He has then something to show for his work, and the time and labor he has put upon his collection of specimens will help to fix their characteristics and names in his memory.

CANADIAN DEPARTMENT

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NATURE-STUDY WORK WITH INSECTS

In the November issue of THE REVIEW, Dr. C. F. Hodge concludes an article bearing the above title with the expression of the hope that "a number of teachers may give to readers the benefit of their experience with this line of work." I take it for granted that the writer of the spirited criticisms of nature-study methods in Vol. VII of the *Pedagogical Seminary* (pp. 95, 208) will not take any objection to the letter or spirit of the following acceptance of his invitation.

A large, and let it be hoped an increasing number of teachers recognize the great difference between *educating* children by the use of natural objects, insects for example, and *informing* children about these objects. Judging from lists of books recently published and commented upon in THE REVIEW, there are writers on the subject who evidently regard the latter as the purpose of nature-study.

A considerable part of the teacher's time and effort has ever been, and probably will continue to be, devoted to imparting information. It is now and always will be impossible for lack of time, if for no other reason, to communicate to children the half of the information that it is desirable nearly every person should possess. Further, certain information that is of great value to some people is of little or no use to others, and lastly the value of information to those who may need it varies greatly with the age and apperceptive fitness of the recipient at the time it is imparted. These considerations raise the question whether as a city teacher I should give any time, and if any how much, to informing my pupils about insects. It is quite another question whether I can with insects profitably employ the children's time in developing their observing and reasoning powers and enriching their sympathies. To one if not both questions, Dr. Hodge's answer appears to be affirmative; he quotes approvingly a city teacher's remark, "the finest nature-study I have ever tried." With the training aim in view I go to his article bearing the title above

quoted for assistance in method. What do I find? An interesting photograph shows a teacher and a pupil passe-partouting ios, lunas, etc., between plates of glass (p. 268); indeed nearly half the article referred to is occupied with the mounting of dead insects. Will someone show the value of this work as nature-study? Its value as manual training to that pupil would be increased if she cut the glass and made the mounting strips herself.

Save as part of the expression of his study which each pupil may make and take away with him, why mount dead insects at all? In the study of the science of entomology their use is evident. But can one teach nature-study from dead insects? No one has published a stronger condemnation of the museum method of teaching nature-study than Dr. Hodge. Has he changed his opinion? He suggests a use of the dead specimens to show pupils when starting them on a competition of egg-hunting. Hunting insect eggs may be more educative than some people would be willing to grant. When children are searching for these eggs they are likely to observe many other things. But if the pupils can find clusters of tussocks' and tent-caterpillars' eggs, can not and should not the teacher also find samples about the time she wishes to start the hunt? With regard to the specimens illustrated on page 266, would not pupils about to study the cabbage-butterfly with such a mounted life-history before them be like the boy studying the answer when he begins to work the problem? They would certainly be deprived of the joy and reward of discovery.

"In the case of insects more than in any other branch of nature-study, a teacher needs actual specimens" (p. 267). Does this imply that there can be genuine nature-study in some branches without actual specimens? Is picture study, not to mention word study, ever real nature-study? I like to keep pictures and books and museums behind the real contact with nature and give them a place, if any, near the close of the expressive stage of the lesson or series of lessons. Give me abundance of material in the condition in which it most closely touches the child's interest. I would modify the third sentence on page 269 to read :—My teaching experience seems to prove that we must have two or three kinds of living insects before the attention of the class at the same time in order to get the best results with nature-study work on insects. Comparison is the easiest and readiest activity to use in the nature-study lesson.

Is it true that the object of nature-study is "the creating and increasing of a loving acquaintance with nature"(E. F Bigelow),

"to put the pupil in a sympathetic attitude toward nature" (Bailey)? If the increase of love and sympathy is a criterion of the efficiency of a nature-study lesson, what is to be said of teaching pupils to kill and pin insects and of emphasizing the duty of destroying them because they are said to levy an annual tax on the agriculturist of 795 millions of dollars?

Both observation and experience convince me that to conduct a nature-study lesson properly I must be an investigator in the field where I am to require my pupils to make investigations. Applying this conviction to lessons on the insect, what have I found? I have a garden; insects do a little harm there but also a great deal of good. It would be only a guess, but probably within the truth, to say that my garden owes a hundred times as much to insects as it is injured by them. Without their beneficial aid I should not have any of my prettiest flowers or my best fruits. My children's favorite pet, a beautiful white cat, repays its board-bill, perhaps many times, by protecting against the birds the insects that are so necessary to the garden's welfare. Clearly my first-hand studies of insects and cats do not lead me to follow Dr. Hodge in preaching their wholesale destruction. Should not my pupils and I speak of things as we find them? If our sympathies err, had they better err on the side of preservation of life or on the opposite one?

The truth is that, having sole regard to utility, some insects should be killed and others protected. I think I should make a mistake if I set out to give the child an emotional bias not justified by the investigations made. My aim should be to train the child how to discover truth through his self-activity. The proper emotional attitude will naturally grow out of the properly conducted and properly completed observational study.

Mere seeing and naming or seeing plus the excitement that accompanies an unexpected novelty, as in the case of the child that saw the ichneumons make "their way out of the caterpillar and spin their cocoons on its back," is little if any better than the old object lesson. To have the merit of education by nature the perceiving must be attended with apperceiving, relating, reflecting, judging—in short with all that stands for investigation, and not be simply an occasion for information or entertainment. The real task is not in getting the children to feed and watch the cabbage-worms, but in making the exercise intellectually and emotionally profitable.

Selecting topics for nature-study by Dr. Hodge's test—"the

things in nature best worth knowing''—is liable to put the teacher on the wrong track. It has been part of my duty to criticize many a nature-study lesson; what I have seen has convinced me that the proper subjects for nature-studies are not the things best worth knowing by adults but the things best worth doing and thinking about by children. Dr. Hodge has declared elsewhere that we need the spirit of genuine research as we need life, that it is ''the breath of life of education.'' If there is any genuine research by pupils in his paper, ''Nature-Study Work with Insects''—I should be glad to have it pointed out.

NORMAL SCHOOL, JOHN DEARNESS.
LONDON, ONTARIO.

THE FOUNDATIONS OF CHEMISTRY IN NATURE-STUDY

II. Oxidation

A day or two before beginning the following experiments, some lime-water should be prepared. This may be done by shaking a few teaspoonfuls of fresh water-slacked lime in a quart bottle nearly full of water. When the undissolved residue has settled, the clear solution of slaked lime (lime-water) may be poured off as needed. Get some wood charcoal from a stove, or prepare some by charring a stick. Bend the end of a common brass wire, about 10 inches long, about a small piece of the charcoal, closely enough to prevent the charcoal from falling out but not to conceal it from sight. Leave the rest of the wire for a handle.

Shake together in a test-tube a few crystals of chlorate of potash and a less bulk of black oxide of manganese.

Try a test stick (a hardwood toothpick is just the thing), first merely glowing at the end, then burning with a flame, in the mouth of the test-tube. Note the results.

Heat the mixture with a spirit-lamp till a glowing stick will burst into flame when held in the mouth of the tube. Keep the tube *loosely* closed with the thumb between the tests.

The pupils may be told that this gas in which the stick will burn so much more readily than in air is called oxygen and that it is a *simple* substance.

Add a little chlorate of potash to the mixture, insert the mouth of the test-tube into the neck of a small wide-mouth bottle held with the mouth turned obliquely downward, and apply heat again till a glowing stick will promptly burst into flame when held in the

mouth of the bottle. Then quickly cover the mouth of the bottle with a wet piece of glass.

Heat the prepared charcoal till part of it is glowing in the lamp flame; hold it for a moment in the air, then lower it into the bottle of oxygen, allowing a piece of card-board through which the handle of the wire passes, to close loosely the bottle's mouth. Note whether charcoal becomes hotter or colder when put into the oxygen, and whether it glows more or less brightly than before.

Remove from the bottle the charcoal remaining in the wire, and before the gas in the bottle has had time to mingle with the air outside, shake a little clear lime-water through it. The lime-water should become quite milky in appearance.

Try the charcoal in another bottle of oxygen if necessary, and make sure, either by balancing the residue against the original weight of the charcoal, or by the change in size, whether the charcoal is disappearing.

Rinse the bottle, collect oxygen in it again, and try whether the oxygen will whiten the lime-water.

After the teacher has performed these experiments before the class, all the children, working in couples, should go through the work and try to obtain results as decided as the teacher did. If delivery tubes are available, the oxygen may be collected in small bottles over water in a bowl or basin.

The facts having been observed and verified by the class, a thorough discussion of the meaning and explanation of the facts by the pupils should follow, the teacher merely directing the discussion. The argument may follow such a course as this: Since oxygen will not turn lime-water white, a gas different from oxygen must have been formed in the bottle when the charcoal (carbon) was burning there. This new gas was not carbon changed into a gas else when the bottle cooled it would have become solid charcoal again just as water-gas (steam) will solidify into ice or frost as soon as it is cooled down to the temperature at which water remains solid. So this gas which whitens lime-water is neither oxygen nor carbon gas. Nor did it come out of either of them, for they are simple substances. Since this gas is neither carbon nor oxygen, nor a part of either, it must have been formed by the carbon which disappeared uniting chemically with the oxygen around it. So we find that the carbon and oxygen disappeared by uniting together to form a new substance quite different from either.

This compound gas, composed of carbon and oxygen, is commonly

known as carbonic acid gas. Because it consists of oxygen and one other simple substance it is called an *oxide*. When carbon or any other substance unites with oxygen, it is said to *oxidize* or undergo *oxidation*.

But how can we account for the charcoal becoming so hot while the oxidation was going on? It must be that the *chemical union*, in some way, produced or caused the heat and the bright light, for as soon as the oxidation ceased both the heat and the light disappeared.

UNIVERSITY OF NEW BRUNSWICK, JOHN BRITTAIN.
FREDERICTON, N. B.

TWO QUESTIONS OF METHOD

Dr. Hornaday's paper, in a recent issue of THE REVIEW, raises two questions of method: one of general method in nature-teaching and one of detail. The latter is the one to which the most interest must attach—that of determining the point of time in the pupil's career, or the stage of his intellectual development, when the provisional and partial classifications of the nature-study grades shall give place to the ultimate generalizations of science. This is a matter which framers of courses of study have yet to dispose of.

The former question—that of the validity of the general method pursued by representative teachers—is one which hitherto had been considered as settled. Indeed, to deny the pedagogic principle which prompts the school to pursue its way to the goals of science along paths strewn with the natural interests and every-day experiences of the child is to discredit the method revealed by psychology for the pursuit not only of nature-study but of every subject of the school-curriculum. Is not our critic overlooking in instruction an element which the teacher of childhood has to reckon with? Is he not fixing attention too much upon the ultimate truths to be learned and too little upon the young learner in his intellectual, emotional and his experiential relations to those truths? Does he not, for the nonce, view as a sufficient end the acquisition of systematic knowledge, no matter by whom systematized? Is not this static knowledge a commodity to be quickly and easily procured by a process (to adopt his own figure) of funneling of text-book facts and figures into empty heads? Is not his ideal pupil too much a passive recipient, and his ideal teacher too much a discloser of short-cuts to knowledge —a knowledge that falls short of power?

Let us be grateful, however, to our sturdy antagonist for the warning he posts for those who tarry too long at the method of the primary school, who affect to ignore the classifications of science, and who regard the text-book only as a necessary evil; who permit "the scanty *scrawls* called 'notes' made by the pupil;" who do the work the pupil could do and would be charmed to do. Let us, however, not be led astray by a symbolism which terms "animal and plant classification the bed-rock foundation" of nature-study. Those of us who have school-work to do with young people will be safer to regard plant and animal classification not as the bed-rock but as the structure reared upon a bed-rock of observation and comparison.

NORMAL SCHOOL,
TRURO, N. S.

DAVID SOLOAN.

DISCUSSION AND CORRESPONDENCE

[EDITORIAL NOTE.—Repeating from a note in the first issue of this journal, the editors invite free and frank and friendly discussion of all papers published. It is to be understood that each writer presents his ideas through this magazine in order to get the commendation or helpful criticism from other workers on similar lines. Therefore, let us have more freedom in the use of this department for correspondence; and if you agree or disagree with any writer do not hesitate to say so. Also if you are to be really helpful do not forget to tell us the reason why for your views.

The letters below follow in the order of receipt at the office of the editor.]

DR. HORNADAY'S "THE WEAKNESS IN NATURE-STUDY"[1]

I

Dr. Hornaday took for the text of his paper the statement made editorially that nature-study is disorganized and not yet established in our school system. This obviously refers to practice rather than to principles or methods; see the discussion of this point in the first article of this issue.

M. A. BIGELOW.

II

My attention has been called to the admirable article of Dr. W. T. Hornaday in your journal. Allow me to congratulate you upon its clear recognition of facts as they exist and its timeliness in the condition of our schools. As matters stand at the present day, I am convinced that the great need of students in all our various lines of science is systematic knowledge; that a correct understanding of facts obtained at second hand from a text-book is much better than a chaotic mixture of those facts without the sense of proportion, obtained by methods frequently in vogue; and that to the pupil who starts with a good general picture in his own mind, it is easier to add details by observation than it is to correct the errors and mistakes which result from being taught from the beginning to overvalue the knowledge acquired at first hand.

ARTHUR T. HADLEY.

PRESIDENT'S OFFICE,
YALE UNIVERSITY.

III

If getting acquainted with the facts were the main object of nature-study, I should think that Dr. Hornaday's plan, or any other plan which directs

[1] See THE REVIEW for October, 1906.

the activity of remembering, would facilitate the business of teaching very materially. For example, I remember how swiftly I was progressing when in my early years I learned by heart the classification in the back of Orton's "Zoology." In comparison my subsequent feats of memory seemed far less impressive to me.

Whatever criticism may be offered against the present undetermined theory of teaching nature-science, we have gone far enough to realize that the old system of science teaching failed because the natural mind gets no satisfaction from studying things in isolation. Our fathers knew more places on the map than we do, including the rivers the places are on, but they didn't know what the rivers are doing, nor why the places are there. The older botanists and zoologists knew their classification and their morphological characters, but the things they saw had slight relation for them to other groups of facts. There is no question now about our children being able to understand facts better, since the schools are taking to the idea of satisfying the *thinking*, not the *remembering*, mind by giving some attention to the interpretation of the facts of nature in terms of other groups of facts which exist in logical relation.

No reasonable person would disagree with Dr. Hornaday in his contention that children should read books, but think of the greater ease with which facts could be "funneled"! I believe all teachers realize that however unsatisfactory much of the object teaching doubtless is, the knowledge of things at first hand means keen intellectual pleasure. Moreover, we all know that a book is interesting in proportion as the contents are related to things already in our store of experiences. This common belief gives sufficient basis for object teaching. The problem we have before us is concerned in the main with the method with which we approach our end, and it consists largely of getting more knowledge of how to handle the subject-matter. The great end for nature-study seems to me to be the extension of our children's knowledge of the material world through the process of thinking. In the course of their thinking they will come to classification near the close, for classification itself is the outcome of a great deal of thinking.

DeWitt Clinton High School, Henry R. Linville.
New York City.

IV

Dr. Hornaday has rendered a distinct service to the pupils in the public schools by pointing out some of the weaknesses in nature-study teaching. The formal teaching of things already known by the pupil, the over-use of lectures, talks and quizzes, the piling up of masses of undigested notes, the discarding of systematic text-books, with the consequent lack of system in the

presentation of the subject, and the gross abuse of the "laboratory method" (as in the introduction of living chickens, rabbits, cats and dogs into the schoolroom)—all these and more too—have made many thoughtful educators shake their heads, and wonder where it would all end. To this wrong tendency in our teaching Dr. Hornaday very properly calls a halt. He is emphatically right when he insists upon more work upon the part of the pupil. The pupil should be able to give each fact in nature its place in a system of knowledge. He should have some idea of the relative standing of the things he studies,—the green slimes, toadstools, mosses, ferns and flowering plants, angle-worms, crawfishes, insects, snakes and cats. "Lower" and "higher" must have definite meanings, as also "simple" and "complex" when applied to living things.

THE UNIVERSITY OF NEBRASKA. C. E. BESSEY.

V

With the central thesis of Dr. Hornaday's contribution we must certainly take issue. The clearness with which his views are stated allows no misconception of his meaning. "The first need of the hour is a text-book;" "the pupil should be required to memorize facts and definitions from his own book;" "they must dig, or they will remain ignorant;" "animal and plant classification" are "the bed-rock foundation" of nature-study; "facts should be set forth according to the system of nature, not by mixing up all living things." "Any sensible children ten years of age can learn and remember for use a certain number of the grand divisions of the animal kingdom. As they grow in intelligence they can build on this foundation. Moreover, the average teacher surely will enjoy teaching a rational, clear-cut, progressive system."

Could anything be more irrational than such a procedure? The cart is before the horse. The child is to begin where the specialist concludes. When there is nothing in the mind to be classified, why classify? Shall we make a study of letter-files as a basis for learning to read and write? So in geography, the author argues that the child should begin "with a bird's-eye view of the world and gradually come down to small details." "Forty years ago geography was taught wholly from text-books and maps, and it was learned far more thoroughly and successfully than it is today. Nature-studies can be taught today from text-books and pictures just as well as geography was taught in the 60's." (If he had said "just as poorly," we could agree with him.) "Nature-study teachers ignore the *system* of nature—the key to all successful zoological work, great or small."

It is scarcely conceivable that so able a man as Dr. Hornaday should utter such statements as the above. Nothing could be more unpedagogical than

the position he has assumed. The most important truth he has stated is that nature-study is far from firmly established in our school system; to this we must all agree. But this condition of things is in very large measure due to just a misapprehension or the aims and values of nature-study as is evinced in the article under discussion. Professedly the primary aim of nature-study (as the writer of the article conceives it) is systematic zoology. With that we should begin, and with that we should end, and we should get it from books. The view here advanced is so absurd that it should be unnecessary to make reply. Taxonomy is man-made, subject to revision, the field of the profound student; book study is not nature-study. If nature-study deserves recognition as a distinct contribution to the curriculum, certainly its merit does not lie in placing a book between nature and the child. First-hand contact is essential; therein lies the whole opportunity. We are teaching children, not subjects. We may be scientific, and yet not organize a science. Certainly there is a place for books,—witness Dr. Hornaday's excellent "Natural History"—but a text-book for a nature-study class is a contradiction of terms and an impossibility. In classes well taught there will be a reference to books and a wholesome respect for scientific authority, but the atmosphere will be anything but booky. "The pupil must be made to do the work," but the hearing of recitations is not nature-study. A boy cannot be forced into an appreciation of the nature world. School children have worn blinders (books) so constantly that the senses seem dulled and there is little of the research spirit If asked to learn something about houseflies, their first thought is toward the library. We should put a premium not upon information, but upon power. What we want most is not a storage of facts, but trained faculties, habits of inquiry, investigation, testing, verifying, interpreting data and drawing legitimate conclusions from original observations. This is what makes useful men and women; the text-book falls from the hand, but these things abide.

He is a good naturalist who knows his own parish thoroughly, and to a pupil of the elementary school "the mice and beetles and sparrows and dog-fennel" that greet him daily are a thousand times more worthy of his attention than are the phylum types of the zoologist. No better product can be sent from the nature-study class to the laboratory of high school or university (and to this, I believe, university men generally will assent) than the pupil whose eyes are open, who is alert, self-dependent, awake to his environment, master of himself and his surroundings; whose native endowment does not cringe before the objective world to seek refuge in bibliography. Arguing for book instruction in nature-study, Dr. Hornaday protests because (as in geography) "the great round world is approached by a long series of

stealthy flank movements, chiefly at the expense of the teacher." The allegation is well founded, and so long as schools shall last the instruction which is worthy of the name will be "chiefly at the expense ot the teacher." Successful nature-study will continue to deal with material within the experience and immediate environment of the child mind. The child will study this material, rather than what some one has said about it; the material will be handled scientifically, in well chosen units, but from the child view-point, not from the view-point of the trained scientist.

"The weakness in nature-study" today is due to the lack of skilled teachers in this work; the explanation lies in the fact that this is a book-trained generation, versed, is may be, in the "analysis" of flowers and in a classification scheme for the animal kingdom, but helpless in the presence of a form not mentioned in the books, unable to follow where "a little child shall lead them."

NORTHERN ILLINOIS STATE NORMAL SCHOOL, DEKALB, ILL. FRED L. CHARLES.

VI

Director Hornaday in his article, "The Weakness in Teaching Nature-Study," fires a broadside of three pages in a manner that suggests, "There, I have demolished everything that you have built. Now get to work and build it anew as it should be." As I heard him banging away at nature-study, I felt like saying in the words of the small boy, "Never touched it." And notwithstanding the note by the editor, that the paper is "full of ideas radically opposed to those commonly accepted by science teachers," I maintain that Professor Hornaday has shot completely over and beyond the mark that he sets up in the beginning—nature-study.

I do not think that the author has said anything against "nature-study." And I am not wholly in agreement with the editor when he tells us that the author has said a good deal that shouldn't be in accord with much of the work of science teachers. Yet I have no disagreement with the spirit of either. A confusion of terms, a failure to remember that there are always two sides to the shield, and two points of view in our relation to nature, is the basis of the author's claim that teachers are "groping in Egyptian darkness for the method," and the editor's previous claim that "nature-study is still so disorganized."[1] I do not believe either theorem, but I do believe that, in the confusion of false demonstrations, we can best get clear of the entanglements, by going back to the axiomatic statements so ably set forth by Professor L. H. Bailey in his book, "The Nature-Study Idea." First and always, the

[1][See I. of this series of discussions.]

child, and the adult, too, should have an informal, heartfelt, sympathetic relation to a variety of isolated, individual, natural objects. This most of us call "nature-study," an unfortunate term, for it really isn't *study*, but rather friendly acquaintance. John Burroughs nicely described it: "I should not try directly to teach young people to love nature so much as I should aim to bring nature and them together, and let an understanding and intimacy spring up between them." Later, with the *desire* for further, definite, formal, intellectual, synthetic relations to classified natural objects, comes what most of us call "science."

I maintain that Dr. Hornaday is right if he is referring to science, and wrong if he is speaking from the nature-study point of view, as I have defined it. He ridicules a book that might contain a "mixing up (of) all living things—birds, bugs, flowers, mushrooms, shells, crabs and trees—in a chaotic mass." Yet he is the director of such a book of living material. I know of no other place where such variety may be found. Looked at by a "nature-study child, what a medley. Viewed by a "science" adult, what perfect system and classification. The other day I took a party (interested in both nature-study and science) to see his open book. Here is the chaotic mass that nature-study found, in the order in which we observed them as we walked along the paths: deer, osprey nest, pelican, crow, elephant, peacock, camel, snowy heron, tiger, lion, fox, wolf, skunk, turtle, snake, sea-lion, raccoon, turkey, grizzly bear, monkey, more sea-lions, rhinoceros, hornbill, cockatoo. What "a chaotic mass." Yet every visitor to the New York Zoological Park knows that innumerable lists might be made, in just such disorderly arrangement, of the things that most appeal to a child when he begins his work of informal nature-study. A scientist goes along the same paths in Professor Hornaday's collection and sees most admirable classification. Likewise the whole world seems a delightful confusion of interests and surprises to the "nature-study" child, but how perfect the plan, how complete the system to a scientist! How interesting to the child to see what the individual plant or animal is doing; how important to the scientist to know, and know well, where that individual belongs. And the whole of the so-called "confusion" or "chaotic mass," is a failure to recognize the fact that we shouldn't always remain nature-study children, and that we cannot be scientists at the start, not even "elementary" scientists. We need first the nature-study spirit; but after this first love has been aroused, do not drop the subject, but gradually lead the student to a knowledge of its strictly scientific aspects. We must learn the alphabet before we can begin to read.

The ideal nature-study book should describe things as we see them at Professor Hornaday's park and everywhere else in the world—a little of every-

thing, just as we, in a walk, see the landscape. "Everything is 'fish' that comes to the 'net' of a naturalist."

The ideal scientific book should have its contents classified and orderly, as we find them in one of Professor Hornaday's well arranged buildings. The Park as a whole, especially with the miscellaneous animals roaming around free in the paths and fields, and into our loving interest, embodies my idea of "nature-study." Each building with its excellent classifications and facilities for accurate, systematic knowledge, is a symbol of my notion of "science." Each phase has its rightful place, and both combined put the observer in an almost ideal relation to the whole Park and to the world.

While my pupils were admiring the snowy owl, we heard the cries of the seal-lions, and the children were eager to rush over to the pool. Should I have said: "Now, be calm, and wait here, while we first study the scientific classification in which those lions have been placed. Then we will go to see them. We must have elementary *science* first, then we may intelligently examine the living specimens." If so, then I should take Professor Hornaday's book, and say, that the name of the sea-lion is Zalophus californianus, that it belongs to the family Otariidæ, of the sub-order Pinnipedia. Then I should have explained that the Pinnipedia are mammals, closely related to Ferae, etc.

I feel certain, from what I personally know of Doctor Hornaday, that he has not lost the "nature-study" spirit of his boyhood days. It was that spirit which started and has continued his desire to be a famous systematist. When he walks about the Park with a company of children, he is yet a big, enthusiastic, nature-study boy. When he leaves the party and goes into his fine office, and sits down at his desk to write, he is one of the most eminent of systematic scientists. And the whole trouble is that he wrote that article for THE NATURE-STUDY REVIEW when he was seated at his desk. To my mind he has written some pretty good advice to science teachers, though I think he has turned his illustrative house upside down, and what he calls the bedrock foundation, I would call the attic.

Now won't he please write another article, a real "nature-study" article, as he walks about and, with pad and pencil in hand, shows his "chaotic mass" to a party of jolly young folks?

STAMFORD, CONN. EDWARD F. BIGELOW.

VII

There is no use in discussing Dr. Hornaday's discussion of "The Weakness in Teaching Nature-Study." There can be no discussion; there can only be a cross-fire of declarative statements. Mr. Hornaday says "it is"

or "it isn't," and most of us reply "it isn't" or "it is." There is not much outcome to that sort of debate.

As teachers we simply *know* better than to follow Mr. Hornaday's advice. If we were historians we should say that the world knows better than to go back to its tested and rejected methods.

The librarian of this university, standing near an extremely absorbed student in the reading room, heard this faithful student of zoology repeating over and over again with utter concentration of mind and devotion of purpose this startling sentence: "This is—the picture—of the—cross-section of—an eel—this is— the picture—of the—cross-section of—an eel—this is —the picture—of the—cross-section of— an eel." This student had adopted and was exemplifying the Hornaday method of nature-study. Needless to say this is not the method which is now or ever again will be adopted by most nature-study students or teachers.

It may be of some value and of some interest to *read* that the Ganges does not rise, or does, if it does, in the Ural Mountains. It is certainly of much more interest, and we believe of much more profit, to *know*, by discovering with our own eyes, how a nameless creek (which is the type of all the streams in the world) rises in nameless hills (which are counterparts of all the mountains in the world) and flows and meanders and fights its way through soft loam and crumbling shale and ringing granite to its goal in the lowlands. One is nature-study according to Hornaday, and the other is nature-study according to most of the rest of us.

But this begins to be discussion. It is not worth while. Whether Agassiz based the Agassiz method of studying nature from nature rather than from books because he believed in that way or because he had no time for any other way, the verdict of the decades of trial of the Agassiz method is that it is the best method so far presented to us. If Dr. Hornaday's method was a new and untried one, it could not be so readily denied validity. But it is the old long-tried, fully-tested and unanimously-rejected one; hence we can refer to it in declarative terms. It is the wrong way.

STANFORD UNIVERSITY, CALIFORNIA. VERNON L. KELLOGG.

VIII

In the Canadian Department in this issue of THE REVIEW there are other discussions of Dr. Hornaday's paper.

[EDITORIAL NOTE.—Letters by President Eliot, Professor Lochhead and several other well known writers will follow in the next number of THE REVIEW.]

BOOK REVIEWS

The Bird: Its Form and Function. By C. William Beebe. New York: Holt. 1906. Pp. 490. $3.50.

In the preface Mr. Beebe says: "I have intended the book more as an invitation than aught else." It can but have that effect upon the most casual reader for the author has certainly accomplished his aim: "To take a few dead facts and clothe them with the living interest which will make them memorable and full of meaning to any lover of birds, and at the same time to keep them acceptable in tenor and truth to the most critical scientist." Mr. Beebe says that he has lectured to audiences of teachers every one of whom was able to identify fifty birds or more, but not one of them knew the significance of the scales on a bird's foot. It is this gap that the book bridges by an untechnical study of the bird in the abstract.

The illustrations are unusually good, numerous and varied. The paper is of excellent quality and the type large and clear. Evolution with its various problems such as those of sexual coloration is well treated; and sentimental personification has been avoided. Interesting—because unusual or unexpected or because suggestive of deeper significance—are all the chapters of this much-needed book. The author gains the confidence of his readers by not attempting to explain everything positively and by frankly including striking and as yet unexplained exceptions to the laws formulated. Points of unusual interest which are well presented are the head and eye difference between the pursued and the pursuer; albinism as related to excessive increase in numbers; the method of making bird sounds (vocal cords being absent in birds); the position and control of the air-sacs and the strikingly small size of the lungs proper; the various causes of color in feathers (pigment in black, red, brown and yellow feathers; miniature prisms in the iridescent colors; and a combination of pigment with innumerable overlying prisms, as in blue feathers which contain only brown or yellowish pigment; and other feathers white because of the innumerable air spaces in them); the peculiar development of the hyoid bone making possible the projectile tongue of the woodpecker; the third or pineal eye and its relation to the soft spot in a baby's head; and the structural likenesses to the reptiles, found in such structures as the occasional bifed tongue, the similar mechanism of color, the scaled feed, the clawed wings and the transition from scales to hair and feathers.

J. B.

RECENT (1905–1906) BOOKS IN NATURE-STUDY AND SCIENCE

Roof and Meadow. By D. L. SHARP. A series of essays by the author of "Wild Life near Home." Pp. 281, ill. New York: **Century Co.** 1904. $1.50.

Among Country Schools. By O. J. KERN. A book of inspiration and suggestion for teachers in rural schools. Pp. 366 ill. Boston: **Ginn & Co.** 1906. $1.25.

Half Hour with Fishes, Reptiles and Birds. By C. F. HOLDER. A reader for fifth grade. Pp. 255, figs. 244. New York: **American Book Co.** 1906. 60 Cents.

The Bird. Its Form and Function. By C. W. BEEBE. Pp. 496, 371 figs. New York: **Holt & Co.** 1906. $3.50, postage 30 cents.

The Human Mechanism. Physiology, Hygiene and Sanitation. By T. HOUGH and W. T. SEDGWICK. A thoroughly modern book for colleges and general readers. Pp. 564, 147 figs. Boston: **Ginn & Co.** 1906. $2.00.

First Course in Zoology. By T. W. GALLOWAY. A text-book for secondary schools, normal schools, and colleges. Pp. 481, 240 figs. Philadelphia: **Blakiston's Son & Co.** 1906. $2.50.

Nervous System of Vertebrates. By J. B. JOHNSTON. A treatise for colleges. Pp. 370, 180 figs. Philadelphia: **Blakiston's Son & Co.** 1906. $3.00.

Entomology. By J. W. FOLSOM. A concise and comprehensive account of insects with special reference to their biological and economic aspects. Pp. 485, 300 figs., 5 plates. Philadelphia: **Blakiston's Son & Co.** 1905. $3.00.

Principles of Botany. By J. Y. BERGEN and B. M. DAVIS. A text-book for advanced high school or first college classes. Pp. 555, 400 figs. Boston: **Ginn & Co.** 1906. $1.50.

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Roof and Meadow. By D. L. SHARP. A series of essays by the author of "Wild Life near Home." Pp. 281, ill. New York: **Century Co.** 1904. $1.50.

Among Country Schools. By O. J. KERN. A book of inspiration and suggestion for teachers in rural schools. Pp. 366 ill. Boston: **Ginn & Co.** 1906. $1.25.

Half Hour with Fishes, Reptiles and Birds. By C. F. HOLDER. A reader for fifth grade. Pp. 255, figs. 244. New York: **American Book Co.** 1906. 60 Cents.

The Bird. Its Form and Function. By C. W. BEEBE. Pp. 496, 371 figs. New York: **Holt & Co.** 1906. $3.50, postage 30 cents.

The Human Mechanism. Physiology, Hygiene and Sanitation. By T. HOUGH and W. T. SEDGWICK. A thoroughly modern book for colleges and general readers. Pp. 564, 147 figs. Boston: **Ginn & Co.** 1906. $2.00.

First Course in Zoology. By T. W. GALLOWAY. A text-book for secondary schools, normal schools, and colleges. Pp. 481, 240 figs. Philadelphia: **Blakiston's Son & Co.** 1906. $2.50.

Nervous System of Vertebrates. By J. B. JOHNSTON. A treatise for colleges. Pp. 370, 180 figs. Philadelphia: **Blakiston's Son & Co.** 1906. $3.00.

Entomology. By J. W. FOLSOM. A concise and comprehensive account of insects with special reference to their biological and economic aspects. Pp. 485, 300 figs., 5 plates. Philadelphia: **Blakiston's Son & Co.** 1905. $3.00.

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Log of the Sun. By C. W. Beebe. A chronicle of nature's year. 52 full page plates, numerous text figures. New York: **Holt & Co.** 1906. $6.00.

Darwinism and the Problems of Life. By Conrad Guenther, translated by Joseph McCabe from third German edition. A study of familiar animals from evolution viewpoint. Pp. 436. New York: **Dutton & Co.** 1906. $3.50.

Real Things in Nature. By E. S. Holden. A reading book of science. Pp. 443, 408 figs. New York: **Macmillan Co.** 1902, reprint 1906. 65 cents, school edition, 50 cents.

Familiar Wild Animals. By S. A. Lottridge. A reader for children. Pp. 115, photographs. New York: **Holt & Co.** 1906. 60 cents.

Bird World. By Stickney and Ralph Hoffman. A reader for children. Boston: **Ginn & Co.** 1906. 60 cents.

How Ferns Grow. By Margaret Slosson. A study of the development of form and variation of fern leaves. Pp. 156, 46 plates. New York: **Holt & Co.** 1906. $3.00

Good Health. By Frances Gulick Jewett. The first of a series of five books on hygiene for elementary schools. Pp. 172, illustrated. Boston: **Ginn & Co.** 1906. 60 cents.

Renewal of Life. By Margaret W. Morley. How and when to tell the story to the young. Pp. 200, illustrated. Chicago: **McClurg & Co.** 1906. $1.25.

Agriculture Through Laboratory and School-Garden. By C. R. Jackson and Mrs. L. S. Daugherty. A text-book of elementary agriculture. Pp. 403, 150 figs. New York: **Orange Judd Co.** 1905. $1.50.

Biology of the Frog. By S. J. Holmes. A text book for colleges. Pp. 370, 94 figs. New York: **Macmillan Co.** 1905. $1.60.

How to Know Wild Fruits. By Maude S. Peterson. A guide to trees and shrubs. Pp. 340, illustrated. New York: **Macmillan Co.** 1905. $1.50.

Practical Physiography. By H. W. Fairbanks. A text-book for the high school. Pp. 542, 403 figs. Boston: **Allyn & Bacon.** 1906. $1.60.

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THE
NATURE-STUDY REVIEW

DEVOTED TO ALL PHASES OF NATURE-STUDY IN SCHOOLS

VOL. 3 FEBRUARY, 1907 NO. 2

TYPES OF THE BEST NATURE-STUDY

I. PRACTICAL WORK WITH MOSQUITOES

BY C. F. HODGE, Clark University

[EDITORIAL NOTE.—As announced in the editorial note in December, it is planned to publish under the general heading "Types of the Best Nature-Study" accounts of the best practical nature-study done during the past year. What have you done? How did it go? In short, here is an opportunity for a lively and helpful "experience meeting;" and if you have worked out any *practical lessons new to your school*, send a note or an article to THE REVIEW at once. Bear in mind that something new to nature-study literature is not demanded. If it is new to your school, then we want it for publication. Your experience will encourage other teachers and help the great movement for the advance of which this journal stands.]

The work which I shall describe was carried out at the Downing Street School, in Worcester, Mass., largely under the direction of Miss Edna R. Thayer with the hearty coöperation of the Principal, Miss Katharine Smith. In deciding what is "best" in the great mass of good nature-study that we see being done we must, of course, take conditions and needs of the neighborhood into the account as well as the lessons themselves. Exactly the same lessons in a locality to which mosquitoes had to be imported for the purpose would have to be rated as the worst piece of nature-study imaginable. I consider this the best piece of insect nature-study because inexcusable abuses of a once beautiful brook had made the mosquito pest the greatest nuisance and a serious menace to health in the district.

The stream in question, known as Beaver Brook, flows with very little fall for more than a mile through the heart of the district. It had cut a channel three or four feet deep below the lowest meadows and woods along its course, and had thus been able to do its work of draining the land efficiently. As the settlement approached the brook the low places were made dumping grounds for ashes and rub-

bish. This was perfectly proper, but the dumping was so carelessly done that side streams were dammed and so made stagnant pools, often acres in extent, along the brook valley. Not only this, but the brook channel itself was made the receptacle for everything unsightly—brush, tin cans, old baby carriages and bicycles, dead cats and hens. Mud from the wash of newly opened streets, collected on these obstructions, weeds grew in the mud, complete dams formed, back water converted meadows and pastures into bogs and fine groves were killed and turned into swamps. This added scores of acres to the mosquito breeding tracts.

Photograph by C. F. Hodge.

Pupils of Downing Street School taking a nature-study lesson on mosquito extermination. May 3, 1905.

The practical work was begun in April. The life-history of the mosquito was discussed with the pupils and they were asked to examine any stagnant water about their homes or in the district and to bring to school anything that looked like the mosquito wrigglers. The result was such an awakening as the neighborhood had seldom experienced. The whole brook valley covered with stagnant water was alive. Specimens were brought in and, in aquaria carefully covered with cheesecloth, could be actually observed to emerge from the water as "sure enough" mosquitoes. This was conclusive and convincing. The universal question: "Where can all the mosquitoes come from?" was answered.

Next, several lessons were given showing how newts and minnows devour mosquito larvae in the water; with the result, we may hope, of making the children more thoughtful about destroying such harmless creatures.

Finally, when interest was at a white heat and everyone was asking, "What can we do about it ?" similar lessons were given with petroleum on the water. The magic of it ! A drop of oil on a tumbler full of wrigglers and in a few minutes every one stretched out dead on the bottom. A few drops on a covered aquarium, and next morning every one of the adult mosquitoes caught by the oil film and drowned.

This was also conclusive and convincing and the proposition to "oil the pools" met with enthusiastic support. Oil was contributed, also money, about three times as much as was needed, and a barrel of gas oil was purchased; and just as the great first brood was about to emerge from the water nearly five hundred school children armed with oil cans and bottles of oil, and with several express wagons that carried five-gallon tanks, began at one end of the brook basin and, under pretty careful direction, oiled every pool on both sides of the brook for nearly a mile. Many hands made quick work and it only took about three hours–from three to about six o'clock–to complete the task. It was my good fortune to be invited and I came home feeling that I had seen the best nature-study excursion of my life. Every minute of it was worth while. I took the picture from farther out in the water in front of the pupils just as they reached the brook and were about to scatter out among the many pools.

After this great excursion a number of the older children volunteered to watch different parts of the district and report if mosquitoes were again beginning to breed, but all reports were negative up to the close of the term in June. The excursion was made about the first of May and about June first I again slipped into my rubber boots and spent an entire Saturday afternoon wading through the worst places and trying to find pools in the brush that had been skipped. Other years the mosquitoes would have made such a trip impossible. As it was I did not succeed in finding a wriggler in the water and did not see a mosquito the whole time. From the amount of oil that was still in evidence, I should judge that people along the brook were wasting a good deal more than necessary to make a sure thing of it.

I do not wish to leave the impression that everything went smoothly. Even for work as good as this there are bound to be croakers. People

who did not know, and could never be taught, the difference between a mosquito and a crane fly, claimed that "mosquitoes were thicker than ever." These, however, were few and could not get a hearing. Then, too, the flighty teacher turned up—one of the typical sort who believe in the "three Rs." The mere mention of "mosquitoes in the building! !" brought her down with a typical case of hysterico-mendacious malaria. When it was learned that there had not been a malarial mosquito in the building and that none of the culex had been allowed to escape, she was given no support and less sympathy.

The best part of my story is to come and its conclusions must await developments at least two years hence. I do not wish to be understood as claiming that this work of the school started the great movement which followed; for, I think, the city engineer had already proposed a plan for properly draining the district. Many influences were combining to force the issue—several of the public-spirited physicians, the Board of Health, and my college biology class had been working on the problem for two years. I still think that the simple nature-study lessons above outlined did more than anything else to arouse the people and to push the measure through the city council.

Through all the worst part of the district for about a mile, a strip of land 110 feet wide was taken with the view of laying it out as a parkway, which should wind gracefully through the valley. In this a cement channel 30 feet wide is now being constructed to drain the entire region and carry the brook through it. Dams are to be constructed so as to keep the channel full and at the same time allow it to be washed clean during freshets, and the whole will be a most valuable addition to the park waters of the city.

The reason I have cited this as a type of "best" nature-study is, again, its relation to the needs and life of the community and the carrying of it through to a definite result which the neighborhood could appreciate as worth the while. Bird lessons, school and home gardening and all sorts of other nature work were being carried on at the same time; and still I am inclined to think that the main reason why for the past year we have not heard one word about nature-study being a "fad," or a "waste of time" is to be found in these simple mosquito lessons. And why should not the children of every community grapple with such problems? Why should they not be encouraged to utilize every possible condition which may instill the sense of mutual coöperation and human brotherhood, and thus grow strong in the principles of intelligent citizenship?

II. CHILDREN'S HOME GARDENS

BY GILBERT H. TRAFTON, Passaic, N. J.

One of the most successful features of the work in nature-study in the Passaic schools has been in connection with the children's home gardens, which have been planted with seeds sold the children in penny packets. The following details in carrying out this plan are given with the thought that they may be of interest to other teachers who would like to try the plan.

The seeds were obtained from The Home Gardening Association of Cleveland, Ohio, (address 501 St. Clair Ave.,) which puts up penny packets of seeds to be sold to the children in the schools of its own city and of any other cities that wish to improve the opportunity. Large order envelopes (price $1.75 per thousand), containing a list of seeds, both flower and vegetable, which may be secured at a penny a packet, were given to the children who wished them and were taken home, where in consultation with their parents the list of the seeds desired was made out. These envelopes, together with the money, were returned to the teacher. In the Cleveland schools the envelopes are sent to the Association where the orders are filled directly, but for other cities the total number of packets wanted in a school or city are ordered, the envelopes being retained by each teacher. The orders for the seeds were sent in before the first of March and the seeds were received during April. The packets were distributed to the various rooms and given to the children in their envelopes. At this time there was furnished each child a direction card (cost $1.35 per thousand) which gives suggestions concerning the care of the garden.

The children have taken great interest in this work. While waiting for the seeds to come the teacher is besieged many times with the question, "When will our seeds be here?" An especially gratifying result has been the interest aroused in the parents. Many of them have spoken to the author, telling of the great pleasure which both they and their children have taken in connection with this work.

The work has been of value in furnishing the children healthful employment and recreation at home during the summer, and in giving higher ideals of beautiful home surroundings.

Two sets of prizes were given last year. One series was given to those schools having the best flower shows, which were held in the fall, the flowers being brought by the children from their gardens.

Another series was given for the best individual flower gardens. The city was divided into sections according to the conditions under which the children worked, the aim being to have those children compete with each other who had about the same opportunities as regards location and size of garden.

Another organization which is doing similar work to the one in Cleveland is the School Garden Association of Boston (address Station A). This Association makes up a number of collections of flower and vegetable seeds, each collection containing five packets of different kinds of seeds and selling for five cents.

III. HOME GARDENS IN CLEVELAND

BY LUCY C. BUELL

Secretary, Home Gardening Association

The sixth year of work by the Cleveland Home Gardening Association, which is described in the report just published, is the most successful the Association has known. The report of 1900, when the work started, shows that forty-eight thousand packets of seeds were sold to the school children of Cleveland. Last year two hundred and forty-seven thousand three hundred and forty-eight packets were sold. Besides this amount of seed used in Cleveland, one hundred and ninety thousand eight hundred and forty packets were sold to outside organizations doing a work similar to that of the Home Gardening Association. This increasing volume of orders has been hard to handle, but with the better facilities which enlarged quarters give it is believed it can be easily handled. The exchange garden, which was opened in 1905, grew into two such gardens last year, while vacant lots cultivated rose from eight to eighteen. Other new features are projected for the coming season which will, it is believed, add much to the usefulness of the Association.

The report for 1906, may be had about February 10th. Address 501 St. Clair Avenue, Cleveland. Price 25 cents.

NATURE-STUDY AND A SOCIAL NEED

BY H. N. LOOMIS

Director of Science, New Britain (Conn.) Normal-Training School

May it not be that the invitation last spring for a list of "ten best books" on nature-study lacked explicitness? Mr. Bardwell in his reply pointed out a difficulty that confronts those who deal at once with children and teachers when he says, "I also seek to know the individual, or individuals, before I recommend books." One gains from the various discussions connected with the nature-study movement, as well as from the lists in the May REVIEW, an idea of the many sidedness of the question. Lessons are given with a certain content and for a certain purpose. On no other basis can one understand the disappointment he encounters as he turns away from the hundreds of "lessons" annually published. By some we are annoyed, while to others we are indifferent. Occasionally we are able to lay the finger on what we regard as defective; usually however, it is a matter of undefined dislike. In the planning of a "lesson" there are two or three things never entirely neglected. A lesson may be planned and taught under the apparent guidance of one of these directing ideas, the others are present, however, as an unconscious habit of thought, or hidden in a previous lesson which serves as a pattern.

Turning to the 22 lists of books submitted one finds confirmation for this contention. There seem to be but two of the lists submitted in which books dealing with the purpose of nature-study and methods of presenting the subject are lacking. Of these two exceptions that of W. S. Hall's itself explains the omission in the following words, "I would suggest the following as we have tested them in our summer home." This writer apparently, is not speaking from the standpoint of the public-school teacher, but rather from that of a cultured parent. These two approaches to the subject are so different in point of view that it is difficult to treat of them together. The second apparent exception is unsigned 21. It speaks of "beginners in nature-study and for a general outlook on plant and animal life," at the same time submitting one of the best lists of books given. The fact that the list is headed by Selina Gaye's great book renders it

impossible to say the list does not supply a point of view from which to attack this perplexing subject.

The fact that these lists of books—exceptions noted—contain works that discuss the point of view from which this subject should be approached, introduces into the confusion a vital and fundamental unity. Furthermore, the work which appears in fifteen lists—or rather sixteen, for it is fair to suppose Professor Hodge omitted his own book on account of modesty rather than failure to recognize its worth —is literally charged with a broad, sound and practical philosophy of our needs in this subject. And that, by the way, is the purpose of this article, namely, to plead for an adequate philosophy. If there is one thing more than another that the movement lacks it is a clean cut and rational rather than sentimental point of view. Because of this lack, sentimentalism, narrowness in outlook, high-handed treatment of those who have held that nature-study should comprehend something more than plants and animals, failure to adequately estimate what is involved in teaching this subject and indifference to public sentiment and social needs have to an unfortunate extent characterized the movement. Before any subject can find secure footing in a democratic system of education, it must work itself free from incidental and special reasons for being and found itself on some perfectly apparent social need. Whatever other reasons one may give for the presence of history in the common-school curriculum, the perfectly apparent one that a citizen of our republic needs to know something of the origin and nature of the institutions which require his support raises this study above all apologetic reasons for its presence in our common schools. If our nature-study is to pass beyond the special pleadings of a few enthusiasts, it must be made to meet some simple, and when clearly stated, perfectly apparent social need. Individualists we may be, yet we cannot expect our individual tastes and predilections to be adopted and instituted at public expense. We sorely lack then, not a large number of incidental benefits, but some simple clean-cut statements of a social need which nature-study can reasonably be expected to satisfy.

This is the reason, I take it, why Professor Hodge's "Nature-Study and Life" is regarded in the May REVIEW and in discussions on this subject as the leading book. Its central idea appears to be that modern social conditions demand of its popular educational schemes something besides "book learning" and that the physical and organic conditions that surround and limit the individual shall be objects for

his serious study. But the distinguishing mark of Dr. Hodge's book lies for me elsewhere, rather do I find it in the marked tendency displayed to put certain questions to the topics before presenting them. Much of our nature-study possesses no permanent worth in that it meets no pressing needs, presents no large truth, promises never to grow richer in the individual's life, nor lead on and out into some large conception of the world. Consequently, when one meets a book with an idea of helpfulness rather than diversions dominating all its lessons, it stands out like an oasis in a barren waste. While no one will claim for the book under discussion anything like perfection, indeed not a little that it proposes I believe quite beyond the possibility of presentation, yet the clearness with which it names the problems for solution, and its freedom from cant and the airy aesthetical has won for itself a unique place in nature-study literature. When the day arrives that writers and leaders in this subject will agree that a lesson which is really worth while must need have a solid content chosen because of a definite purpose in mind, a purpose that has taken shape not in the woods or by the babbling brook—tho' few enjoy "walks" more than I—any more than in the easy chair, but a purpose that results from mingling with one's fellows on the farm, in the home and in the mart—with a purpose thus born a great step will have been taken towards securing a place for nature-study and elementary science in the school program.

Today it is undoubtedly true that on completing the great run of school programs, city and country, the child steps into a world to which schooling makes him but a little the less a stranger. So far as being any the more capable of intelligently performing the common home duties, of taking hold of shop-work with an enhanced intelligence, of bringing to farm life a quickened appreciation of plant and animal needs, of entering business with some understanding of evidence and a trained sensitiveness to cause and effect relations, of good habits of personal hygiene and moderations in all things,—so far from this or something like this characterizing the common-school product, we are actually told by parents, shop owners, merchants, physicians and educational commissions that the school is of doubtful value to the individual when confronted by the actual situations of life.

So far as actully receiving from the school some definite equipment for life along these lines, the individual is actually a little less apt at taking in situations, and forming quick conclusions than before years

of schooling had fixed certain habits of mind. The alertness and quickness of apprehension found in the backwood-man and street gamin suffers fearfully under present curricula. This loss, together with failure to impart much that is of the very best of our modern world, point to a social need.

To me, the province of nature-study and elementary science lies right here. The field is unoccupied by the traditional curriculum. The purpose is to bring early to the developing individual the agencies employed by the best of his kind in living their material lives, that he may receive in a democracy his rightful heritage—a fair opportunity.

AGRICULTURE IN PUBLIC SCHOOLS

By W. C. LATTA

Professor of Agriculture, Purdue University, Lafayette, Ind.

Agriculture is a very comprehensive term. It means sometimes merely the cultivation of the soil for food products; sometimes the several activities of the farm; sometimes the oldest and largest of the three great industries of the human race; and sometimes the science of the culture of the soil.

None of these meanings will serve for the present discussion. In order that we may think and speak to the point, let us attempt to define, or illustrate, just what *is* meant by agriculture in the public schools. As makers of definitions, however, let us remember how difficult it is to include and exclude aright.

We will exclude, largely, the theory, business and economics of agriculture. We will dismiss, also, the technique of agriculture, as, for example, the aims, means, and methods of agriculture practice and the problems of farm management. We will include the phenomena and forces of nature as they actually exist, having in mind first, those most familiar, and later those less known. Then, too, as the normal child is forever asking "why," we will include the relations of phenomena and forces—especially those of cause and effect. Our subject will, also, include the effect of environment on the life of the child, on all life, and on the practice and products of the farm. Our subject will further include the story of nature as a whole and in her various moods, so far as they come within the scope of the child's mind, and vitally, or strikingly, affect or impress him. The keynote of the subject "agriculture in the public schools" should be nature-study; and the minor chord, agriculture.

At first the child is led to observe and study nature's forces from the standpoint of himself —how they affect his comfort, his pleasures, or his plans. Little by little the true teacher will lead the child to see how these same forces affect the lives of plants and animals, his schoolmates, and men and women, and also how they affect the operations and results of the farmer.

Thus led, the unfolding mind of the pupil will come to discern more clearly the relations of phenomena to natural forces, the wider

and yet wider applications of these forces to the life about him and to the work and success of the farmer. With this widening range of vision there will be a growing interest, which under wise guidance, will often crystallize into a definite purpose to study systematically the subject of agriculture. This study, which has begun with the more conspicuous phenomena and forces of nature, might properly be extended to include at least the elementary phases of agricultural botany, economic entomology, birds, toads, reptiles, and mammals in their relations to the farm, agricultural physics, agricultural chemistry, meteorology, agricultural geology, principles of breeding and feeding, animal nutrition, and the diseases of plants and animals. In this way may be laid, deep and broad, in our public schools, the foundation for the making of the broadly intelligent and useful man and the self-respecting, enthusiastic, and successful agriculturist.

To put it briefly and figuratively, yet truthfully, agriculture in the public school is the flowering and fruiting of nature-studies along agricultural lines.

Why Have Agriculture in the Public Schools?

Assuming that all present have caught the speaker's idea of agriculture in the public schools, the question arises, why have such instruction in these schools?

Of the many reasons for an affirmative answer to this question the following, at least, are important:

(1) The subject, in most of its ramifications, is of perennial and universal interest. The experience of intelligent and sympathetic teachers in all grades of school work, both in city and country, amply justifies the assertion that there is nothing better than the study of natural phenomena and natural forces to create and maintain the interest of the pupils of all ages and nearly all temperaments.

(2) The subject sustains a vital relation to the life and well-being of the individual and of the community. Take a single illustration from one phase of the subject, the weather. If no other subject suggests itself, or if all other topics fail, we fall back on the weather. Why? Because in a very large and real sense it is the making or unmaking of us all.

(3) The subject is not only interesting and inspiring, but it is also definitely practical. It has to do with the problem of bread and butter. It deals with the here and now. This reason appeals strongly to the school patrons—especially those living in the country. All

over our fair state farmers are asking that the education of the children be made more helpful in solving the every-day problems of life. This attitude is rapidly crystallizing into a demand for revision of the school curriculum, in order that agriculture may have its rightful place in the course of study.

(4) The subject often appeals strongly to the apparently dull or plodding, or supposedly incorrigible pupil, who takes little interest in the purely academic studies and who knows more of brooks than books, more of the parts of a fly than of the parts of speech.

There are many examples of persons whose intellectual faculties have been stimulated to normal activity, and whose interest has been aroused by natural history subjects outside the school curriculum.

(5) The subjects of nature-study and elementary agriculture appeal strongly to the æsthetic, the imaginative and the spiritual in the child, lifting him above the brain racking problems of cube root and complex fractions, above the mercenary level of percentage and profit and loss, and above the wearisome definitions of subjunctives and infinitives into the diviner atmosphere, throbbing with impulses and wooings and suggestions which both nourish and gratify the finer instincts and sensibilities and aspirations of the mind.

(6) Another reason for making elementary agricultural science a part of the course of study is the interest it generally awakens in mathematics and language, or the opportunity it affords for training in these lines. The problems of natural science require a knowledge of both arithmetic and language to compute and define. Thus the student will come to find the real value and use of figures of notation and figures of speech in the solution of problems nearest to his heart and life.

(7) Another reason which applies particularly to the rural schools is the right of the country children to a school training which will specially prepare them for life on the farm.

The great majority of these children do not get beyond the eighth grade. If special instruction in the elements of agriculture is denied them, they must be greatly handicapped in their efforts to win success and become useful citizens.

(8) Another excellent reason, and the last to be mentioned, for placing the subjects of nature-study and agriculture in the public schools is that they call for and make possible a truly pedagogic order of procedure. These subjects are of vital interest to the pupil; they appeal

at first to the active, observing, and not to the dormant, reflecting faculties; they cultivate the normal and healthy activity of both mind and body; they call into action the several qualities of mind and spirit; they cultivate originality, self-direction, self-reliance, self-control, independence, patience, perseverance, sincerity, simplicity, sympathy, love of the beautiful, recognition of a higher power and the need of working therewith to gain control of nature's forces, and then use them for material and spiritual advancement.

How to Introduce the Subject

It is quite possible that the foregoing reasons for giving instruction in agriculture in the public schools may not appeal to some teachers present.

Recent information, however, from over half of the county superintendents of schools in Indiana leads to the conclusions that many, perhaps a majority of teachers are in an attitude of expectancy, at least, and are ready for suggestions as to how the subject of agriculture may be introduced and taught in the public schools.

What will be said on this point will have special reference to existing conditions and to our own state.

(1) Special instruction relating to familiar objects, phenomena and forces should begin at the very outset of school life, and should continue throughout the entire public school course. At first the objects for consideration should be chosen solely for their interest to the child. The objects should be so studied as to throw light on the real life and immediate environment of the child. In this way interesting knowledge of real utility will be gained day by day. As the work progresses the applications of the knowledge gained to the general welfare and to the work and problems of the farm should receive attention. The instruction should proceed along such lines and by such steps as will maintain the enthusiastic interest of the pupil.

(2) Under present conditions this special instruction should, in most cases, be given as a general exercise once or twice a week. Sometimes before, and sometimes after, the presentation of a subject by the teacher the pupils may be requested to make observations and report later to the school. The skill of the teacher must be exercised to suit the work requested of the pupils, to their ages and degrees of advancement.

In reporting, by pupils, on special work assigned, both oral and written methods should be used. Care should be taken by the

teacher to make the most of the opportunity to train the children in the art of expression and in the use of good language.

If corn fields are near, let the older boys compute the per cent of a perfect stand the per cent of barren and of smutted stalks, and the relation of smut to barrenness,as shown by percentages. See that the pupils having like data get like results, and thus impart a good drill in multiplying and in the use of the decimal point. Incidentally the student will gain a new conception of the practical value of language and mathematics.

This drill, however, should not be so rigid, or frigid, as to check spontaneity or vivacity of expression. Remember that *enthusiasm* must be maintained even though the canons of the grammarians may be occasionally violated.

(3) In the view of the speaker, elementary instruction in agriculture should be introduced in *all* our public schools, of both city and country, as soon as the teachers can acquire the necessary preparation therefor. The truly interested and resourceful teacher can readily get sufficient preparation to begin this work at the opening of the next school year. Professor Bailey's book, "The Nature-Study Idea," the several elementary text-books on agriculture, the bulletins of the U. S. Department of Agriculture and of the experiment stations, the well-equipped laboratories and the teaching force of the schools of agriculture, the successful farmers, fruit growers, dairymen, stockmen in the vicinity of the schools,afford ample means and facilities for speedy and inexpensive preparation for such instruction.

The essential that the teacher *himself* must supply is a *royal will* to get the preparation. No feeble desire, no half-hearted purpose, no spurt of enthusiasm will accomplish it, but a fixed purpose and the wise use of the time and means which every teacher can command will bring it to pass.

Does some one urge that this is impossible with the already over-crowded course of study and the over-worked teacher? Nothing is impossible that has been and is, even now, being accomplished. All over this state, north, south, east, west, teachers in single-room and consolidated country schools, and teachers in township and city schools are now giving at least occasional instruction in nature-study and the elements of agricultural science. More than this, most of these same teachers find that with the increased interest of their scholars the awakening of the dull and indifferent pupils, and the improved discipline of the school, their "load" is really lightened and not increased, as some of them feared.

Fellow-teachers, beware of the pessimistic croaking of some school officials, some school patrons, and of some wealthy, but miserly, childless tax-payers. Demonstrate what can be done under *existing conditions* in the way of elementary instruction in agriculture, and th s will be the best argument for improved conditions which will make possible large and better things in the future.

(4) The speaker further believes that the systematic but elementary *text-book* study of agriculture should be taken up with the seventh grade pupils as soon as practicable, and that the subject be continued with increasing thoroughness throughout the rest of the public-school course.

In order that this may be speedily and effectually accomplished, the speaker would respectfully urge:

(1 st) The early and thorough revision of the course of study and the giving of kindergarten and nature-study work, domestic science, elementary agriculture, and manual training their rightful place in the school-curriculum;

(2nd) Consolidation of the rural schools as fast as conditions and public sentiment will permit;

(3rd) Lengthening of the school year in the country, and such increase of wages as will secure the best teachers;

(4th) The examination of teachers in the subjects of nature-study and elementary agriculture;

(5th) The general establishment of rural high schools, centrally located in the farm communities which they serve, as fully equipped and as ably manned as the best city high schools.

In conclusion the speaker would call attention to the over-shadowing importance of agriculture to the common weal and to the standing and stability of our government and nation.

Every one should have, at least, a tolerably intelligent view of the nature and magnitude of the oldest and greatest of callings.

Every one should have some knowledge of the problems and achievements and sterling worth of the yeomanry of our land.

The walls of separation between town and country are rapidly breaking down under the influence of the new education, and they should soon be banished forever.

We are one people, north and south and east and west, denizens of cities and dwellers in rural districts—all are one in fact and should be one in sympathy, one in purpose and effort to make our common country an earthly paradise and the United States the garden spot of the world.

Agricultural education, rightly understood and interpreted intelligently and sympathetically imparted, and universally diffused will be one of the most effective means to these great ends.

Fellow-teachers, ponder well the problems and aims and ends of industrial education in all their phrases and bearings.

Remember that we are, and must ever be, an overwhelmingly industrial people, facing industrial problems which can only be intelligently and effectively solved by those who have an industrial education. Remember that, after all, the great work of education is to enable its possessor to live helpfully, hopefully, serenely, and successfully in the immediate environment.

Bear constantly in mind that the only school of the toiling millions is the *public* school. Will you not therefore as teachers in these public schools strive to make the education you impart in the highest possible degree helpful to your pupils and patrons?

Do not measure your success by the few you induce to enter the high school or college, but rather by the many who, through dropping out of school, have been inspired by your influence to seek and do good, and been have helped by your teaching and training to perform well some necessary, and, hence, some worthy work.

[*The Educator-Journal.*]

DISCUSSION

DR. GROUT'S "METHODS OF TEACHING NATURE-STUDY"[1]

I

Several readers have noted in Dr. Grout's paper these sentences: "The difference between nature-study and elementary biology is not clear to most people. Personally the author believes thev should not be differentiated but should become synonymous." What justification could be offered for such duplication in our school system?—is the question which readers have asked. We have referred the question to Dr. Grout and this is his answer:

My statement does not mean that identical work should be done in the grades and in high school. The biology I studied in post-graduate work was not the same in content as that I studied in college. Science is classified knowledge. Nature-study, so called, often fails to become science because it is too hit or miss and gives information in a pleasing but hap-hazard way. I believe that grade work should be planned so as to be truly scientific, but that it need not be one whit less interesting for that reason.

On the other hand I believe that elementary biology in the secondary school is often so much like college work that it looses its attractive features. It should be modified so as to become as pleasing as the nature-study now taught by our best teachers. It should come as naturally after the grade work as algebra after arithmetic. The only difficulty at present is the absolute scarcity of properly trained teachers, and as long as a jockey gets from five to fifty thousand dollars a year to ride a man's horses and a tutor for his boy gets only one thousand, and other like things in proportion, so long we shall have this difficulty to contend with.

Boy's High School, Brooklyn, N. Y. A. J. Grout.

II

In the excellent paper on "Methods of Teaching Nature-Study," by Dr. Grout, I find two points which demand comment. The statement is made that "marvelous and striking facts are legitimate and highly useful material"; one reason that the actions of the sensitive plant arouse so much attention is that motion is an unsuspected power of plants and also quite unusual"; "un-

[1] See this journal for October, 1906.

usual and little known facts about common things are two classes of facts that one can usually rely upon to serve his purpose in nature-study." This is dangerous doctrine. "Little known facts about common things" are as a rule worth while, but what legitimate purpose in nature-study is served by an emphasis upon the "unusual," "marvelous" and "striking?" Is the four-leaf clover more worthy of consideration than the humble three-leaf? Do we wish to perpetuate the type of man who quits work for the afternoon, harnesses his team, drives to town and pays his admission fee to see the two-headed calf, when he would invest neither one hour nor two cents postage in the scientific study of a one-headed calf? This passion for the bizarre and spectacular, this craving for something new under the sun, is altogether too common already; perhaps we may say that it is not in the least abnormal, but this does not argue that it is wholesome nor that it should be encouraged. Continuous vaudeville may be a useful antidote, but for steady diet there are much better viands. It is the ignorant who are ever looking for signs and miracles. For the enlightened mind—and for the growing naturalist—there is a more lasting joy, the joy of the commonplace. Whom Dame Nature loves best is not received in state, on extraordinary occasions; but is admitted into the secrets of her household economy.

Bird study has now so many devotees that a comment on the portion of the paper dealing with this subject may not be out of place. "After learning the appearance of the bird," I quote, "it is quite easy to learn to recognize it in the field." So commonly have I seen this method followed—picture study, pure and simple, with directions to go and find a bird corresponding to the picture—and always with most dubious results, that I shudder whenever I find it employed. With the younger children the suggestion is too powerful to be overcome. A boy is shown the pictures of birds which are advertised to appear in the neighborhood; he becomes an adept in the recognition of—pictures; under the influence of strong suggestion he sallies forth and straightway observes the original of his favorite picture. "Are you *sure* you saw a red-breasted nuthatch?" asks the conscientious teacher. "Yes ma'am." "Describe it for me, so that I may know if you really saw one." "The boy, if he is in good health, glibly describes the picture, is credited with the observation, and is puzzled to know whether he is guilty of a fairy story or a lie. A keen observer who had visited an exercise of this kind characterised it as "a hotbed for liars." So long as the English sparrows, canaries, pigeons, poultry, and perhaps robins and bluejays are to be had commonly about our homes, we had best study them rather than the pictures of birds outside the range of vision. When a boy has seen the real thing, then is a good time for him to locate the bird on the color chart. The pic-

ture is very useful, almost indispensable, but it should follow and not precede. There is little value in resorting to picture study; let the picture be truly supplementary.

I do not wish to read into Dr. Grout's paper anything which is not there; but without modification the inferences are not tenable.

FRED L. CHARLES.

STATE NORMAL SCHOOL, DEKALB, ILL.

DR. HORNADAY'S "WEAKNESS OF NATURE-STUDY"

I

To my thinking the real reason for the unsatisfactory condition of nature-study in American schools in general is that it is practically impossible in many places to find teachers who are competent to direct the study in an intelligent manner. Dr. Hornaday's article on the subject seems to me very far from being a helpful contribution. Surely he misstates and exaggerates on his first page the difficulties of the situation. His derision of "teaching from the object" seems to me very harmful.

I take it that the object of nature-study is to get into the child's mind something of the naturalist's method. That can never be done by memorizing facts out of a book. If the object were merely to acquire information, Dr. Hornaday's text-book method would doubtless be quicker than Professor Lange's method of "getting acquainted with life about our homes." Nevertheless, it is not necessary for those of us who believe in the utility of "teaching from the object" to maintain that books, maps, pictures, and diagrams are useless;—indeed, most of us think that such records and helps should be abundantly used. We are convinced, however, that they can never take the place of good training in observation.

Wishing you all success in promoting all wise forms of nature-study, I am,

Very truly yours,

CHARLES W. ELIOT.

PRESIDENT'S OFFICE, HARVARD UNIVERSITY.

II

Dr. Hornaday's October article very properly calls serious attention to some alarming weaknesses of nature-study teaching in our elementary schools. It is fairly well-known that much of our so-called nature-study teaching is a farce, a delusion and a snare. Most of it is aloes-coated, not sugar-coated; minced so finely by the teachers that even the youngest pupils look upon it as a hash suitable for babies; it is nature *de-natured* with many silly juvenile

stories thrown in to add flavor; and the investigating spirit of the pupils is snuffed out as soon as its presence is detected.

While these defects are fairly well-known to the readers of THE REVIEW, and to those responsible for the training of teachers, it is doubtful if the methods advocated by Dr. Hornaday will mend matters in the least. As a matter of fact, his methods are being tried unsuccessfully by hundreds of teachers who think more of the name and place of the animal or plant in the great system of nature than they do about its relations to us, and its value as a working force in the economy of nature, and who thinks more of the subject-matter than they do of the pupils under their charge.

If nature-study stands for anything pedagogically it stands for *natural study*, i. e., a *method* or means of developing mental power in the pupil by begetting an attitude of inquiry into the meaning of the things of nature so that the truth is discovered through the exercise of the activities of the pupil. Dr. Hornaday's insistence on book-study and classification will defeat the very object of nature-study. We want more of the spirit of the old field-naturalists and less of that of the modern systematists. We want the child to find out for himself the values of the great organic forces of nature. The method must be that of the investigator. Books are valuable, even indispensable, but they must be kept in their place. The study of books and pictures instead of the forces themselves is fundamentally wrong.

Dr. Hornaday has evidently in mind as he writes the children of the great cities, where, he says, there is "no life about their homes." Unfortunate are those children who live in tenement houses where the front view is the hard walls on the opposite side of the street, and the rear view is the dull laundry yard of unknown or unfriendly neighbors; but have they not parks with trees, flowers, grass, birds, squirrels, insects and other living things that are worthy of study? There is a greater need in large cities for a sympathetic study by the school children of every available plant and animal form. In rural districts, on the other hand, where organic life forms so prominent a part of the child's environment it would be subversive of the natural order of things to make classification the basis and mainstay of his study of nature.

Unfortunate indeed, are the children with a teacher who "marshals facts by the thousand and places them in empty minds" without any effort on the part of the children, under the impression that such is nature-study. It would be far better to use the time in studying books and pictures, but we should be careful not to call this kind of study nature-study.

We, as teachers, must realize that the value of knowledge and education depends as much, even more, on the way the truth is taught or learned as on

the truth itself. Classification and comparison of forms in the system of nature belong to the later stages of nature-study, for the pupil is not interested in classifying until he has something to classify. Occasionally they "may serve as a foundation from which to investigate the forces of living nature with a view to understand the laws of their action and to discover means to utilize and control them."

Children are not interested so much in matters of classification, origin, and structure of the organism as they are in matters relating to its growth, its habits and its dynamic power in the community.

MACDONALD COLLEGE. W. LOCHHEAD.

III

While recognizing some exceedingly valuable elements in the article by Director Hornaday in the October issue, I believe I also recognize some which ought not to pass unchallenged. May I express my dissent in the columns of your valuable journal?

On page 242, lines five to nine, the author says:—"A more inadequate foundation for zoological work could hardly be devised," than that of "getting acquainted with the life about our homes." Now we teachers who have been so fortunate as to read the lives of many of the greatest naturalists that the world has ever seen, know that the true foundation for their zoological, botanical, or geological work was laid through a childhood spent in the observation and collection of natural objects in their own neighborhood, and that at first they mixed up all living things "birds, bugs, flowers, mushrooms, shells, crabs, and trees." Thus was produced those great men who made the natural sciences possible. They became naturalists, not on account of any sound basis laid in their school studies, but in spite of the influence of those studies. Again, we teachers know of certain very prominent naturalists of the present day and we can assert from our own knowledge that the love of nature that led them to become her devotees was obtained in a very similar manner, not in the schools, but in the fields and woods. As the result of the growing realization that the basis of all scientific development is the direct study of natural objects and phenomena, our wiser educators have induced us to bring this promising method into the school course, and modern laboratory work is the result. The nature-study movement is but the attempt to create a wider sympathy with nature and develop heretofore neglected mental powers by bringing nature into closer contact with those whose long term of school imprisonment and whose changed conditions of life have kept them from nature.

It should not be necessary to say that we teachers have seen and used both

pictures and books and believe them to be valuable adjuncts to a good course in nature-study, but unfortunately we are also aware of the fact that these adjuncts are more often over used than under used. A teacher in one of the public schools of our State (N. Y.) felt that she must comply with the new syllabus and give a nature-study lesson on the hen. She therefore went to her friends and asked them where she could find a good picture of a hen. She was at last successful and fulfilled her obligation to the State by showing the picture and getting the pupils to talk about it—and this when a five minutes walk would have taken her class to a neighboring poultry yard. We can assure Dr. Hornaday that in very many cases nine nature-study lessons are given with pictures, talks and books, to one with a natural object or with natural phenomena. If this is to be the character of our work it will not take long to demonstrate its utter uselessness. For my part I sincerely regret that a naturalist has entered the lists *apparently* as a champion of the work of little effort and of least worth. One who has studied the real animal as to form, covering, movement, habit, structure or any standpoint whatever, has come to know that a picture is hardly more like the animal "all in all" than a shadow is like the man who casts it.

In justice to Dr. Hornaday we must note that he says his remarks are devoted to the course for "pupils of reason and sense." Now perhaps one of the chief functions of nature-study is to present vivid basal ideas to the child, to give him material on which he may profitably exercise and test his growing powers of reason. That these powers are neither developed nor tested by books we may be most certain. Take a book like "Science and Health" and see how beautifully it tests the reasoning power of hundreds of thousands of our American school-bred population. Note also a yet greater number of "scholars" who today uphold opinions or dogmas so diverse that a portion of the public begins to doubt if any of them are true. Where have been the men of "reason and sense" throughout the great warfare of science from the time of Copernicus to the present day—in the majority or in the minority? At what age do our children become "pupils of reason and sense?" Let those who can, answer. But there is one thing this nation needs today above all other things and that is MEN "of reason and sense" and our schools must discover the kind of work in childhood that has done most to develop such men and then give this work to our school children. Good as they may be, the study of geography, language and some other subjects have never developed this power and as lately taught, never will. All knowledge we now possess was obtained by some one at first hand through observation. We do not wish to re-discover the field already known, but we do wish that we had more men with the mental power to do so. That

power can only be trained by the doing and I earnestly urge that we make our nature-study differ from other subjects in that every lesson shall be an effort to get knowledge at first hand through observation of either natural objects or natural phenomena.

STATE NORMAL SCHOOL, PLATTSBURG, N. Y. GEORGE H. HUDSON.

IV

In accordance with the invitation to discuss the article "Weakness in Teaching Nature-Study," published in the October issue of the REVIEW, I wish to take this opportunity to protest against the principles involved in that article, for I believe them to be detrimental to the greatest good that the child may acquire from nature-study.

The article seems to be written from the standpoint of a specialist who puts the science of zoology first and the child second. This is a mistake too often made in much teaching; the child should be put first. The purpose of nature-study should not be to develop scientists with a systematic knowledge of biology, but to develop men and women with some appreciation of nature's vast realm.

The chief aims of nature-study which have found quite general acceptance in the columns of THE REVIEW are three: (1) the observational study (2) of common things (3) to create an interest therein. All three of these would receive scant fulfillment if the principles of the article under discussion were carried out.

One of the chief features which has lead educators to look with some degree of favor upon the introduction of nature-study into our schools has been the opportunity offered to develop the child's powers along new lines. If nature-study is reduced to the level of mere memory work, what justification is there for introducing such a subject into a crowded curriculum which already overtaxes the child's memory?

One of the chief difficulties which the author has met in his supervision of nature-study has been the tendency of teachers to make the subject one of mere memory and book work. To advocate this doctrine is to rob nature-study of the vitality which it has slowly been acquiring, and to reduce its educational possibilities to such a low ebb that it could have little claim to a place in our schools.

PASSAIC, N. J. GILBERT H. TRAFTON.

V

Probably most of us who are in touch with school work today would take exception to Dr. Hornaday's assumption that geography was better taught forty or fifty years ago than it is today. If geography means a

"knowledge of the earth and its inhabitants", truly the grammar school pupil of today knows far more than did the one in the corresponding grades in the 60's; this would be evident to any unprejudiced investigator. Then knowledge of geography consisted largely of ability to locate places on a map, "bound" political divisions, etc.; and most mental pictures of towns, cities, rivers, consisted of dots, stars, irregular lines as these were represented on maps. Now pictures of scenery, descriptions of life of the people, including occupations, etc., have extended and vivified that knowledge with the effect of greatly broadening the outlook. Not only that, but lest it may be claimed by some that all this is at a sacrifice of such knowledge as was formerly gained, allow me to refer to what occured in our own city recently. A grammar principal obtained a set of examination papers of fifty years ago, including arithmetic, spelling and geography. The same questions were given the pupils in all our grammar schools, with the result that the answers were of a far higher average; and contained, moreover, a much smaller number of those absurd blunders which come from memorizing language without having adequate understanding of the thought. So much for the "old time" geography.

Now, what is Dr. Hornaday's object in nature-study? As far as may be gathered from his article, it seems to be the acquisition by the pupil of a certain store of facts concerning *animals* and *animal* life (?), although the latter might be omitted by inference from his emphasis upon "zoological forms."

For the moment accepting this as the chief object to be attained, is putting a text-book into the hands of a pupil with *supplementary* exhibition of "*available* objects" likely to secure this result? I recall too vividly instruction of that sort in chemistry, in geology, in botany during high-school days, to believe it; for that which was mainly "words, words" then has had to be learned since as fact. I would not be understood as decrying the use of books as sources of information, but they should be the *supplement* after the objects or selected typical ones have themselves been studied so that the pupil has some definite concepts in mind and so something to build upon, or center new ideas about. The main difficulty in so using books, heretofore, and will be for some time to come, is that we must train up a corps of teachers who can themselves intelligently study the life about them and then supplement their knowledge by that which others have gleaned and stored in books.

No one surely would take exception to Dr. Hornaday's emphatic statement that "the pupil must be made to do the work," although most of us would consider the compelling force to be the inherent interest of the subject itself, not the teacher who introduces the subject and directs and helps the pupils over difficulties.

Why should plants, the heavenly bodies, the weather, physical and chemical forces, and even the soil itself receive no notice, when every moment they thrust themselves upon our attention and we must take cognizance of them? And how can we have any intelligent notion of the life of animals, even, without some knowledge of their vital relations to these others?

Isn't it better to gain some ability to see facts, some power to see relations between different forms of life, some power to draw conclusions from observed facts and above all to gain interest which shall lead to a continuance of such study after school days are over? And ought we not to recognize the fact that while one aspect of nature appeals to one portion of the school, other phrases are more interesting to other portions? What provision does Dr. Hornaday make for those activities both mental and physical which at the period of life which he has in mind are so noticeable, and which should be made to conduce to the welfare of the child and of society?

What shall the pupils of the "primary department" who have not "reason and sense," do? How shall they acquire these desirable possessions?

Aren't many of the evils of the day the direct result of taking everything upon authority, memorizing what was put before us, and then when some facts were found contrary to the teaching received, cause a complete overthrow?

Would it not be better to cultivate that form of mind which shall "prove all things, hold fast that which is good—and true"?

OFFICE OF SUPERVISOR OF NATURE-STUDY,
SPRINGFIELD, MASS.

FANNIE A. STEBBINS.

BOOK REVIEWS

The Frog Book. By Mary C. Dickerson. New York: Doubleday. 1906. Pp. 253, illustrated. $3.50.

"The Frog Book" describes and pictures the North American Salienta [Anura] "with a study of the habits and life-histories of those of the north-eastern States." As stated in the introduction, "It is hoped that the book not only will introduce the elementary nature student to the fascinations of pond life, but that it will suggest to the more advanced student serious work on classification, life-histories, and habits of North American Salienta."

Fifty-six species and five varieties are described, making the work quite complete. There are more than three hundred illustrations, including colored plates and half-tone engravings, picturing all the species described. These are nearly all from photographs from life and are uniformly excellent. The interest of the scientific student will perhaps centre chiefly about these illustrations.

Considerable space is given to a general biological discussion of the group, and the balance of the book consists of detailed discussions of the appearance and habits of the various species. It is written throughout in a popular vein, the various stages of frog life being correlated with wild flowers, birds and so on in a way that will surely arouse the interest of the layman. The thirty odd pages given to the American toad is perhaps the most interesting as well as the most suggestive section of the book.

But the work is more than interesting, it is quite accurate and very usable. Two keys are given, a natural one to families, and an artificial one to species, based on external characters. This latter key is both simple and accurate. The author shows a generally conservative attitude in classification, but in at least one genus, i.e., Bufo, her position is open to question.

The life-histories are a disappointment from the viewpoint of the scientist. It would seem that the "ten years of observation and study" to which the author confesses should have furnished more accurate data on such fundamental points as breeding seasons, number of eggs laid, quantity and kinds of food, etc. One can only hope with the author that the paucity of information on these points will stimulate the scientific student to serious work.

The success of the volume as a popular hand-book is assured, and it is undoubtedly the best number published in this series.

Clark University. Chas. E. Disney.

Familiar Wild Animals. By S. A. Lottridge. New York: Holt. 1906. 60 cents.

A series of sketches and pictures chosen from "Animal Snapshots," which was reviewed in this journal Vol. 2, page 73. The animals selected are woodchuck, opossum, fox, mouse, squirrel, flying squirrel, bluebird, robin, swift, bobolink, screech owl, sparrow, hawk. The book is intended "to help stimulate school children in the direct observation of outdoor life. It is certainly interesting reading.

The Renewal of Life. By Margaret W. Morley. Chicago: McClurg. 1906. $1.25.

This is a book intended to suggest to parents and teachers ways of dealing with the problem of teaching children the important facts concerning the origin of new individuals among plants and especially animals. Recognizing that the great majority of her readers have not had the instruction which might prepare them for teaching others, the author has in great detail gone over the facts to be taught and the best ways of presenting the facts.

A few extracts will give an insight into the point of view of the book: "The child's best teachers of these intimate truths are undoubtedly his parents." "Where biology is taught the pupil comes to a clear understanding of the main facts." "The most beautiful and ideal way of presenting the renewal of life is through nature-study." "The problem for the instructor to solve is how fully to acquaint the child with the phenomena of the reproductive life without making the subject unduly prominent."

The leading part of the story of the origin of life is made to center around the development of flowers, fishes, amphibians and birds, which so well pave the way for understanding the life of a mammal. The problems of training children for the moral life are clearly suggested in Chapter XII, and especially in the last chapter dealing with the transformation of the adolescent period. The appendix contains a good list of helpful books.

The book, with rare exceptions, is agreeably free from sickly sentimentality, and usually direct to the point in plain and yet delicate language. There are places where it ought to be plainer, for there are many otherwise intelligent parents and teachers whose own profound ignorance concerning these vital problems will make it impossible for them to guess the important meaning involved in some guardedly worded paragraphs, especially in the last chapters. However, taken all in all it should be read by all parents and educators who have not already formulated their own ideas on the problems involved. It is safe and sound.

Among Country Schools. By O. J. Kern. Boston: Ginn. 1906. $1.25.

This attractive new book by Superintendent Kern, of Winnebago Co., Ill., is not a book on agriculture (for this Mr. Kern prefers practical study);

it is not a teacher's manual; it is not in any way allied to text-books; but is a book of suggestion, inspiration and encouragement for making country schools better and through them rural life more worth the living.

The book is the result of seven years of very earnest thought and hard work in an endeavor to secure for the country child his rights so far as an educational opportunity is concerned. In the training of children and the development of character no greater opportunity can be offered than that now presented to the teacher in the country school. The author hopes that this book will prove suggestive to the teacher and school officer who are striving for the spiritualization of country life through the medium of the country school. He believes that a careful reading of its pages will show a practical way of interesting the "farm child through farm topics."

The volume contains chapters on The Country Child's Rights, The Outdoor Art Movement, School-Gardens, Art for the Country Child, The Work of a Farmer Boys' Experiment Club, Educational Excursions, The New Agriculture and the Country School, Consolidation, The Training of Teachers for the Country School.

Field Tables of Lepidoptera. By Wm. T. M. Forbes. Davis, Bannister & Co., Worcester, Mass. Pp. 141, one plate. $0.75 net.

In the past few years more requests have come to me for some means of distinguishing and naming the different caterpillars than for any other ten topics in nature-study. All sorts of caterpillars are brought into the schools in spring and fall. They are the easily collected, long-period, actively feeding and hence destructive stage in the life of a butterfly or moth; and when the child asks what they do and what they are, it is discouraging to be told all the time: "Feed them and take good care of them and perhaps next year they will turn into butterflies or moths and then we can tell what they are and may be able to find out more "about" what they do." Mr. Forbes has been doing this ever since his early grammar-school years and as a result, at graduation from college, he is enabled to give us the first key to the caterpillars of North America east of the Mississippi. This "key" fills about two-thirds of the book. It will enable the student chiefly by characters visible to eye or hand-lens to determine practically any caterpillar he picks up. In addition there is a valuable "Color Key to Butterflies," and tables giving for 151 butterflies, 49 sphinxes, 17 imperial moths and 21 moths of economic importance the names, scientific and common, description, dates, size, number of broods, frequency, and haunts; and for their caterpillars, descriptions, foods and seasons.

The difficulties of printing a book of this character have made it somewhat expensive, but to any nature student it will certainly prove many times worth the price. C. F. H.

NATURE-STUDY AND SCIENCE NOTES

Snakes Charming Birds. In your November number you published a note concerning the charming of birds by snakes. Some five or six years ago last summer I was sitting in our garden in Connecticut when I suddenly became interested in the excited cries of a number of robins and vireos that were swooping down through the maple trees, through a hazelnut bush and up again on the opposite side into a button-ball tree. After a second's rest they would swoop back again, always passing through the same spot in the hazelnut bush. I went over to investigate the matter and found a blacksnake (over four feet long by actual measurement later), wound among the branches of the bush, with its head held stiffly erect and its eyes fixed intently on a half-grown vireo perched sleepily on a branch some four or five inches above it. I had hardly seen the bird when it closed its eyes, gave a little gasp, slid off of the branch, and settled down into the snake's mouth, its head protruding. I had nothing with which to kill the snake and while my father was on his way I watched. After settling into the snake's mouth, the bird gave no more sign of life. It died apparently without any pain whatever. The snake began to roll the little body round and round in its mouth. It may have continued this for a minute; then it was killed by my father. I picked up the dead bird and found that the lower part of the body had been entirely stripped of its feathers. I have always believed this to be a case of charming, but I have never seen any other instance of it, before nor since.

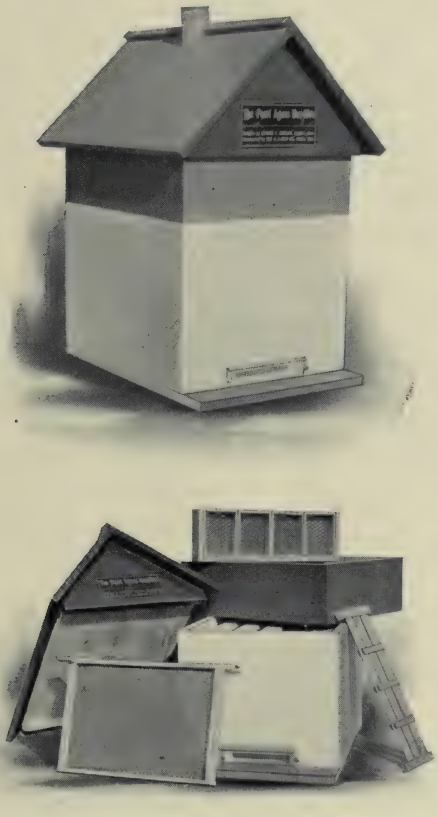
CALHOUN, ALA. W. E. BROWN.

Ferrets and Telephone Wires. A note in the "Nature and Science" department of *St. Nicholas* describes the use of ferrets for pulling wires into underground conduits. The ferret is muzzled and fitted with a harness attached to a strong string. A caged rat is placed in the tube and as the ferret chases the rat the string is drawn through the tube. The rat and ferret are caught by a wire cage at the other end. By means of the string a small steel wire is drawn through and this in turn draws the telephone wires. Without the muzzle the ferret might kill the rat and leave it as an obstruction in the tube.

Cockle-Bur Seeds. There are two seeds in each bur. Professor Arthur, of Purdue University, finds that in round numbers, in 25 per cent of the burs the seeds do not grow, five per cent produce two seedlings each, and 70 per cent one seedling, the first year, and about one half of these will pro-

duce the second seeding in the second or third year. Further experiments have shown that it is the lower seed which germinates first, the upper one resting a year or more. [*Plant World*, Oct. '06.]

A Miniature Bee-Hive. The accompanying figures represent a miniature bee-hive, devised last year by Dr. E. F. Bigelow, of *St. Nicholas*. The



main body of the hive contains five frames, each one-third the size of the standard Hoffman frame. The super contains sections about one-fourth the size of familiar "pound sections." The chimney of this house-like hive is really the feeding tube. The hive illustrates the structure of regular hives. Its small size makes it very convenient to handle and interesting to children. A full description by the inventor has been written for *Gleanings in Bee Culture*. It is manufactured by the A. I. Root Co., Medina, O.

Dissemination of Seeds of Osage Orange. The editor of the *American Botanist* invites readers to suggest explanations concerning the method of seed dispersal in the case of the osage orange fruits, which are so sticky and disagreeable as to repel all grazing animals. Rolling is one apparent explanation, and floating on water another.

Gipsy Moth. An abbreviated account of this insect, which many entomologists consider the most dangerous ever introduced into America, has long been needed and is now supplied as Farmers' Bulletin 275 (free, Dept. Agriculture, Washington). Every nature-study teacher who deals with insects should read this pamphlet.

The animal has now spread from the vicinity of Boston to 2480 square miles of Massachusetts, also in the sea-coast towns of New Hampshire, in a few places in Maine, Rhode Island and Connecticut. In 1900, when the Massachusetts State Board of Agriculture after ten years' work was compelled to stop because the legislature did not make an appropriation, the insect was restricted to 360 square miles. Five years of inactivity (1900-1905) resulted in the great spread to the areas named above. Three hundred thousand dollars have been appropriated by Massachusetts for 1905, 1906, 1907; $30,000 for experiments with enemies; 20 to 50 per cent of cost of the fighting the moth must be paid by cities and towns; owners of property must destroy eggs, pupæ, and nests; Congress at its last session appropriated $82,500 to prevent spread of the gipsy and brown-tail moths; and bills will be introduced into the present legislatures of the other States to which the gipsy moth has spread.

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RECENT (1905–1906) BOOKS IN NATURE-STUDY AND SCIENCE

Log of the Sun. By C. W. Beebe. A chronicle of nature's year. 52 full page plates, numerous text figures. New York: **Holt & Co.** 1906. $6.00.

Darwinism and the Problems of Life. By Conrad Guenther, translated by Joseph McCabe from third German edition. A study of familiar animals from evolution viewpoint. Pp. 436. New York: **Dutton & Co.** 1906. $3.50.

Real Things in Nature. By E. S. Holden. A reading book of science. Pp. 443, 408 figs. New York: **Macmillan Co.** 1902, reprint 1906. 65 cents, school edition, 50 cents.

Familiar Wild Animals. By S. A. Lottridge. A reader for children. Pp. 115, photographs. New York: **Holt & Co.** 1906. 60 cents.

Bird World. By Stickney and Ralph Hoffman. A reader for children. Boston: **Ginn & Co.** 1906. 60 cents.

How Ferns Grow. By Margaret Slosson. A study of the development of form and variation of fern leaves. Pp. 156, 46 plates. New York: **Holt & Co.** 1906. $3.00

Good Health. By Frances Gulick Jewett. The first of a series of five books on hygiene for elementary schools. Pp. 172, illustrated. Boston: **Ginn & Co.** 1906. 60 cents.

Renewal of Life. By Margaret W. Morley. How and when to tell the story to the young. Pp. 200, illustrated. Chicago: **McClurg & Co.** 1906. $1.25.

Agriculture Through Laboratory and School-Garden. By C. R. Jackson and Mrs. L. S. Daugherty. A text-book of elementary agriculture. Pp. 403, 150 figs. New York: **Orange Judd Co.** 1905. $1.50.

Biology of the Frog. By S. J. Holmes. A text book for colleges. Pp. 370, 94 figs. New York: **Macmillan Co.** 1905. $1.60.

How to Know Wild Fruits. By Maude S. Peterson. A guide to trees and shrubs. Pp. 340, illustrated. New York: **Macmillan Co.** 1905. $1.50.

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WILBUR SAMUEL JACKMAN

January 12, 1855-January 28, 1907

THE
NATURE-STUDY REVIEW

DEVOTED TO ALL PHASES OF NATURE-STUDY IN SCHOOLS

VOL. 3 MARCH, 1907 NO. 3

WILBUR SAMUEL JACKMAN

January 12, 1855—January 28, 1907

Probably most readers of THE NATURE-STUDY REVIEW have read in the newspapers that Professor Jackman, whose name is one of the most familiar to all students of the development of nature-study in America, died in Chicago on January 28th, at the age of fifty-two years. It seems fitting that this journal devoted to the advancement of nature-study, to which Professor Jackman contributed so much in its pioneer days, should place in permanent record the leading facts of his life.

Wilbur Samuel Jackman was born at Mechanicstown, Ohio, January 12, 1855. He graduated at the State Normal School at California, Pa., in 1877. After teaching three years, he studied at Allegheny College from 1880 to 1882, and then entered Harvard College and graduated in the class of 1884. After a brief career as a remarkably successful science teacher, he was called to the Cook County Normal School by the late Colonel Francis W. Parker. When Colonel Parker accepted the presidency of the Chicago Institute—now the College of Education of the University of Chicago—his first appointment of associates was Professor Jackman. He was dean of the College of Education for three years (1901-1904), and for two years past he has been principal of the University Elementary School. Since 1904 he has edited *The Elementary School Teacher*.

Professor Jackman's work in connection with the nature-study movement has been well written in Bailey's "Nature-Study Idea" and deserves a place in this sketch:

"The introduction of elementary science as an organic part of school work, ranking with arithmetic and grammar, was made

in the Cook County (Ills.) Normal School as early as 1889, under the presidency of Francis W. Parker. This introduction was made by Wilbur S. Jackman, whose teaching and writing in nature-study lines are well known. In 1884 Mr. Jackman began teaching biology in the Pittsburg High School. During five years' connection with that school he became strongly impressed with the necessity of having a broad foundation laid in the elementary grades for the study of science. The pupils were ignorant of the simplest phenomena that occurred about them. In the spring of 1889 he planned a general course in nature-study and presented it to the Superintendent and the Principals of the ward schools in Pittsburg. It was agreed that in the fall he should have the privilege of meeting the teachers for the purpose of starting this work in the primary and grammar grades. Before the year closed, however, he received an invitation from Colonel Parker to enter the Cook County Normal School and take up the work with him. He entered on the work in the Cook County Normal School in the fall of 1889. During this year (1889) he elaborated the plan already begun, as above outlined. The features which perhaps most distinguished this scheme of nature-study were: (1) That it adopted the apparently irregular plan of using all the material which the "Rolling Year," season by season, brought into the lives of the children; (2) that it rejected the idea of close and specialized study of inert or dead form and sought to place the children in the fields and woods that they might study all nature at work; and (3) that, instead of looking upon nature-study as being supplementary to reading, writing and other forms of expression, nature-study in itself became a demand that these subjects should be taught. In the fall of 1890 he published bi-monthly pamphlets averaging about 75 pages each, which were called "Outlines in Elementary Science." In the spring of 1891, upon the completion of the series, Henry Holt & Company asked the privilege of reprinting and issuing them in book form. This was done. There was considerable correspondence concerning the name, which resulted finally in the adoption of the term "Nature-Study for Common Schools," and this term has been used continuously ever since."

In recent years administrative duties have kept Professor

Jackman from his work for nature-study. His wife (Ellen Reis J.) writes: "He loved this work and gave it up reluctantly; and in the last year he was delighted with the field for study opening before him."

Professor Jackman's leading contributions to the nature-study movement are the following books: "Nature-Study for Common Schools," 1891; "Number Work in Nature-Study," 1893; "Field Work in Nature-Study," 1894; "Nature-Study and related subjects," 1898; "Nature-Study for Grammar Grades," 1898; "Nature-Study Record," 1895; and numerous articles in educational journals. Most of these are so well known to all who have followed the advance of nature-study that mention of the titles is here sufficient. Whatever changes in viewpoint have come, or are still to come, in nature-study as a phase of education, the critical student of Professor Jackman's writings must recognize the great value of his pioneer work. The name of Jackman must always stand pre-eminent in the first chapter of the history of educational nature-study.

Such in brief review is the record of Professor Jackman's achievements in the educational world. But no biographical sketch is satisfying which omits all reference to a man's life as a man, for we instinctively consider the human side in estimating a completed life.

"But Professor Jackman was more than a great teacher and an incisive writer; he was a noble man, nobly planned, and the educational world has sustained a large loss in his death. He stood for all that was best in both his personal and his professional life, and he was so highly esteemed because of the splendid qualities of his character. Character in its best sense was the golden thread in his brief but honored life, and it gave unity to his thoughts, perpetual sunshine to his temperament, and constancy to his friendship."—W. S. Monroe in *Journal of Education.*

M. A. BIGELOW.

SHOULD AN AMERICAN NATURE-STUDY SOCIETY BE ORGANIZED?

In order to get as soon as possible an answer to above question from very many nature-study workers, I have decided to print at once the following suggestions, which for some time have been in my desk awaiting mimeographing for circulation in letters to many nature-study workers whose opinions were wanted before publishing the question for a general answer. However, not the opinions of ten men or even of one hundred, but rather the opinions of at least one thousand should ultimately decide such a question. Therefore I have thought best to put the suggestions directly into print, so that the more than two thousand readers of this issue of THE REVIEW may be asked to express their opinions as to the advisability of attempting to organize a national society for the advancement of the nature-study movement. The idea of printing, instead of mimeographing for limited circulation, has come so recently that there has not been time to show the manuscript even to my colleagues of the editorial committee of THE REVIEW. Whether the suggestions given below are impractical or not, the question is important enough to warrant a canvass of nature-study workers for an expression of opinion; and I hope that the readers of the following notes will at once write their *frankest criticisms.*

My experience with the editorial work of THE REVIEW has convinced me that the time has come when nature-study workers ought to be united in a strong national organization. The following are some reasons: (1) in order to get more closely in touch with each other's work, (2) in order to get more educators and scientific men into touch with nature-study movement, and (3) in order to demonstrate the extent and strength to which the nature-study movement has already attained. Of course all these are important steps in the advancement of the work in general.

In support of the preceding claim for the value of organization, it should be noted that, with the exception of the nature-

study workers who are associated in the national meetings for science and education, few know each other. Personal contact, even in an annual one-session meeting, would be helpful. We need an organization which will bring groups of nature-study workers together, probably in at the annual meetings of the national science and education societies, but not under their organizations. Moreover, we need an annual directory showing the location and work of each serious worker with nature-study problems.

Another fact indicating need of organization is that few people realize how widespread the nature-study movement has become. Many people, especially those from abroad, seem to think that nature-study is chiefly an interesting experiment under the direction of the former students of three or four colleges which have given special attention to the subject. Even principals of certain training schools have made remarks showing that they have failed to grasp the idea that nature-study is no longer limited to the few localities made well known by some of the pioneer work. In all such cases, and my experience is that they are far from rare, the influence of a strong organization would certainly be of great value in advancing nature-study.

Another argument for organization is that it would dispel rapidly the still-too-common belief that there is little agreement concerning nature-study. The careful reader of the first two volumes of this magazine will not find serious disagreement concerning fundamentally important questions discussed by the leaders in nature-study. Organization would go far towards demonstrating to those who do not read or who have failed to understand the leading literature on nature-study that agreement on essentials has been reached and that nature-study is now on a sound basis.

And still another argument: It is not necessary to do more than mention the well-known fact that the societies for teachers of history, languages, mathematics, manual training, etc., have done a great work for the advancement of these subjects in education. It ought to be possible to do as much for nature-study, for during the past three years we have built up a sort of informal organization through our friendly co-operative work with

THE NATURE-STUDY REVIEW. We have learned much concerning the work of each other. We now have an established journal for interchange of ideas, and for news and reviews concerning the things most interesting in the nature-study movement. In short, it seems that the way has been well laid for the development of such an organization as is here proposed.

The following suggestions concerning possible ways of handling details of organization are submitted as a bases for discussion:

NAME OF THE SOCIETY. *American Nature-Study Society* would be in line with the names of many of the science societies. Of course, the "American" is to be taken in the broad geographical sense, and not limited to the United States. Perhaps readers will have other suggestions.

MEMBERSHIP. Any persons seriously interested in the educational bearings of nature-study and elementary science should be eligible to membership, and those actively engaged in educational work should be classed as active members. A mail vote on final organization should be taken when one thousand persons have agreed to become charter members.

FEES. There should be no admission fee. The annual dues for all members should be *one dollar*. As provided below, it would be possible to make this pay necessary expenses and also the cost of sending THE NATURE-STUDY REVIEW without additional charge to members.

OFFICERS should be a President, five Vice-Presidents, a Secretary-Treasurer, and ten Directors. The President, Vice-Presidents and Secretary-Treasurer should constitute an Executive Committee for the transaction of ordinary routine business authorized by the rules adopted. All the officers together should constitute a Council with the following duties: fix times, places and programs of meetings; act as a nominating committee as suggested in the latter paragraph; consider and report to the society all business proposed for a general vote and manage the business of the society according to rules which may be adopted by general vote of members.

TERMS OF OFFICE. For the President and Vice-Presidents one year, the Secretary-Treasurer three years, the Directors two

years (five of the first directors should be elected for one year, and five for two years).

ELECTION OF OFFICERS. A mail ballot for officers should be taken when members are remitting their annual dues, preferably in January. Any member should have the right to mail nominations two months before election and any name thus receiving fifty votes should be considered nominated and the name published in the list of candidates submitted for vote. In addition to such possible nominations by members direct, the Council should be authorized to make nominations for all officers. The above plan appears to be based upon sound democratic principles and not likely to lead to oligarchial or autocratic rule in the society.

COMMUNICATIONS TO MEMBERS. To avoid the great expense connected with mailing letters to members, it is proposed that THE NATURE-STUDY REVIEW be adopted as the official organ (subject to the terms in the next paragraph below); and all communications from the officers of the society (such as concerning elections, proposed business, membership dues) shall be printed in pages reserved for the official announcements of the society. After two announcements of proposed business, a majority of the votes received by the Secretary before the dates specified should decide all questions submitted to vote.

THE NATURE-STUDY REVIEW. The present publisher of this established magazine would offer it as the official organ on the following terms:—(1) The society would assume no financial responsibility for the magazine. (2) The publisher would require eighty cents for each member, leaving twenty cents for other purposes. (Less than 80 cents if number of members reduces cost of printing).

This proposition is financially sound as follows: Experience shows that eighty cents net for each member would at present cost publish 1,000 copies of THE REVIEW. The permanent subscriptions from institutions and non-members would help to decrease cost. A membership of 2,000 would allow twenty-five per cent increase in pages printed or a corresponding saving for other purposes of the society. Even at eighty cents for each member, leaving twenty cents for administrative purposes, $200

per year would be available for expenses of meetings. By using THE REVIEW for communications to members, the great expense of letters would not be necessary. Even receipt of remittances for members' dues could be indicated by change of date on address-label of THE REVIEW.

Another possible economical arrangement would be for THE NATURE-STUDY REVIEW to receive subscriptions from members at $1.00 per year, and then pay the Secretary-Treasurer of the society twenty cents for each member. The advantages in this arrangement are that THE REVIEW would have to maintain the office-machinery for handling orders from outside the society and could handle the subscriptions from the members without expense to the society. Also a periodical may enclose blanks for subscription in the regular issues thus saving cost of special postage and clerical work.

If the proposition to use THE REVIEW as an official organ meets with approval, all 1907 subscribers to THE REVIEW will be credited with dues paid for this year, if they become members of the society. A statement of account will be rendered to the Secretary-Treasurer when elected.

As heretofore, THE REVIEW would continue to be a medium for free discussion of all problems; but a standing notice to be inserted would make it clear that authors as individuals are responsible for ideas expressed in signed articles.

STATE NATURE-STUDY SOCIETIES. It will probably be advantageous to work out some plan for co-operation with the State societies now organized. Perhaps officers of these societies will make suggestions.

DRAFTING A CONSTITUTION. If the general plan for organization of nature-study workers meets with favorable reception, the suggestions volunteered by prospective members should be used in drafting a proposed constitution which should be submitted through THE REVIEW for consideration before a vote for adoption.

DIRECTORY OF MEMBERS. One will be published by THE REVIEW. Prospective members are requested to give names in full, official positions, name of institution if engaged in educational work—otherwise business or profession and address.

ORGANIZING COMMITTEE. A committee of ten should prepare plans for organization, draft a constitution, and publish its proceedings in THE REVIEW. If this suggestion is approved, each prospective member is invited to mail a list of ten names suggested for this committee. The secretary of THE REVIEW will tabulate these replies and publish the twenty-five names receiving largest number of votes. The first ten should constitute the committee on organization, which should appoint its own chairman and secretary, and serve until completion of organization and election of officers.

If the general plan meets with your approval and you will be one of a thousand charter members, kindly send name and address to the undersigned, marking the paper or postal card "for membership in nature-study society." Also send your suggestions regarding name of the society, its constitution, and your ten nominations for the organizing committee. The final vote for organization and officers ought to be announced in the May or September issue of THE REVIEW. If organization seems desirable, the plans should be rushed as rapidly as possible so as to arrange for a one-session meeting when the science societies meet next December. Will you join in the organization of an American society for the advancement of nature-study?

M. A. BIGELOW.

OFFICE OF THE NATURE-STUDY REVIEW,
TEACHERS COLLEGE, COLUMBIA UNIVERSITY,
March 1, 1907.

PROGRESS OF THE NATURE-STUDY IDEA IN TEXAS

By A. M. FERGUSON, Choctaw, Texas

The nature-study idea has made and is making great progress in Texas. This is evidenced in a positive way in a large number of city and rural schools where either as nature-study in the narrow sense or as elementary agriculture it has taken its place as a school study. However it has not yet attained anything like general recognition as a school subject in the Lone Star State. These actual victories I do not care to discuss at this time; but the popular recognition of the *idea* has made very rapid progress. If a forecast is permissible, it would not be very hazardous to predict that in a few years every school in the state will have recognized the idea and acted on it.

For nearly two years the idea has been growing in favor with teachers and particularly with the governing officials of our schools. The support that has been given has for the most part found expression in the resolutions of agricultural associations, and to some extent in the formal declarations of teachers' meetings. Of course, in the former "elementary agriculture" has been mentioned in particular. Expressions from other sources have recognized nature-study as a part, or in common with industrial education, manual training, etc., with here and there a specific mention of one or more of the natural sciences.

Recent developments are very encouraging. Within the last year a "General Educational Committee" was formed, whose particular object was to secure favorable recognition for industrial education in the platform of the dominant political party (Democrats). In this they were successful. The nineteenth plank, which was well received, reads in part as follows:

"* * *; that there be provided adequate agricultural equipment and teaching force for the State Normal Colleges, the College of Industrial Arts for girls, and the Agricultural and Mechanical College; and that industrial thought in the schools be encouraged by teaching the elements of agriculture and the industrial arts; that the Agricultural and Mechanical College, the College of Industrial Arts for Girls, and the State Normal Colleges be authorized to grant diplomas having the force of teachers' certificates to all who complete the necessary course as graduates in the industrial branches;"

The General Educational Committee has become an Industrial Education Association. This Association proposes to follow the party declarations through the legislature which is now in session, and to see that elementary agriculture becomes a regular subject of the prescribed course of study for the common schools.

At its meeting just closed, the State Teachers' Association adopted resolutions strongly favoring the introduction of agriculture into the common school course of study.

Other evidences of the increasing popularity of the nature-study *idea* are at hand. A recent bulletin from the State Superintendent of Public Instruction on course of study for the common schools gives eleven pages of suggestive outline for a course of instruction in elementary agriculture. In former years it was only casually mentioned. Within the last year elementary agriculture has become a regular subject in the course of instruction in two of the State normal schools, and in the third an equivalent amount of instruction is given to nature-studies having more or less an agricultural significance. Each of the three normals contemplate maintaining school-gardens during the current session.

In view of the liberal popular indorsement that has been given, it is most likely that the current session of the legislature will pass some laws intended to prepare our teachers to give more instruction in the natural and physical sciences.

Agriculture is already taught in a great many local schools on the initiative of individual teachers or superintendents. In one county every school is reported to have formed classes in agriculture. Even these early and necessarily imperfectly organized courses have been received with favor by both pupils and patrons.

The progress of the nature-study idea has been most decided during the last two years. During the coming two years we have reason to expect all our schools to give more or less instruction in nature-study work.

THE RELATION WHICH SCHOOL-GARDENS MAY BEAR TO INDUSTRIAL AND COMMERCIAL GEOGRAPHY

BY AMOS W. FARNHAM
State Normal and Training School, Oswego, N. Y.

[Read before the Section of Earth Science, New York State Science Teachers' Assn., Dec. 27, 1906.]

Many of our leading educators recognize school-gardens as a valuable means of instruction in elementary schools. Many of our leading cities have made provision for school-gardens; and many teachers have found that they contribute not alone to successful teaching, but to successful class-management as well. Many children have found school work more congenial, and the schoolroom and school grounds more attractive because of their experience in, and the products of the school-gardens. The popularity of school-gardens is shown by frequent contributions to educational magazines, contributed by enthusiastic advocates and read by teachers no less enthusiastic. Also their popularity is often shown by programs of educational meetings in which school-gardens receive at least "honorable mention." Occasionally a normal school indorses the school-garden idea in a practical way, and in its annual report gives large, illustrated paragraphs on the subject. The United States Department of Agriculture, realizing that school-gardens are an important and almost necessary means of instruction, has recently issued a pamphlet of forty pages in which the value of school-garden work is discussed. (This pamphlet is called "The School Garden," and is known as Farmers' Bulletin, No. 218). In the President's message, under the heading, "Farming a Profession," the President says:

"In all education we should widen our aims. It is a good thing to produce a certain number of trained scholars and students, but the education superintended by the state must seek rather to produce a hundred good citizens than merely one scholar, and it must be turned now and then from the class book to the study of the great book of nature itself * * * All students now realize that education must seek to train the executive powers of young people and to confer more real significance upon the phrase, 'dignity of labor,' and to prepare the pupils so that, in addition to each developing in the highest

degree his individual capacity for work, they may together help create a right public opinion and show in many ways social and co-operative spirit."

It is now half a century since Europe instituted school-gardens. Austria, Sweden and Germany were the first to introduce them, but other leading European nations quickly followed their example. These gardens were considered the most practical form of agricultural nature-study. But it was not until the year 1891 that a school-garden was opened in America, Boston taking the lead in the movement. The beginning was a modest one, consisting of the utilization of a small plot of ground in connection with one of the grammar schools. This plot was devoted not to agricultural nature-study, as were the first European school-gardens, but to the raising of native wild flowers. We learn that a few years later this same school added another small plot for the cultivation of vegetables—a step toward realizing the end for which the first school-gardens were created and cultivated. In 1903, just twelve years after Boston had taken the initiative, statistics showed that more than fifty cities of our country had made some provision for school-gardens. What has been done along this line during the last three years, we have not statistics at hand to show, but when we consider that the school-garden movement is a popular one, and that Americans are not slow in putting popular ideas into tangible form, it is safe to say that the last three years have witnessed the opening of as many school-gardens as had already been opened from 1891 to 1903.

School-gardens in our country are almost entirely conducted in the interests of nature-study, and are often denominated nature-study gardens. Now nature-study does not seem to be very definitely outlined. In fact some of its strongest advocates say that it can not be outlined without doing violence to the spirit and aims of nature-study. Some supervisors go so far as to leave their teachers free to choose the topics to be presented to the pupils under their care. This indefiniteness has brought out the criticism that nature-study "has no beginning and no end;" that it begins with "almost any topic and ends whenever a sufficient number of topics have been suggested to fill in the allotted time." A school-garden conducted in the

interests of an unorganized course of nature-study must share the same criticism which such a course may receive.

School-gardens are as yet in a stage of experiment. It is only fifteen years since the first school-garden was opened in America. Their function is not fully defined. But may they not realize all that is claimed for them, satisfying all of the demands of nature-study, and at the same time be so well correlated with some of the phases of industrial and commercial geography that even a greater interest may be created in nature-study, in school-gardens, and in industrial and commercial geography as well?

Some of the claims for school-gardens set forth by the U. S. Department of Agriculture are: quick discrimination; skill with the hands developed by handling small seeds and various tools; systematic methods which follow from the order in which the operations conducted in the garden must be taken up; industry; the idea of ownership and the rights of ownership; business experience which is an important result of harvesting and accounting for the products which are grown; and a basis of knowledge, provided the operations connected with the school-garden are properly conducted, i. e., if the requirements of the different crops in regard to preparation of soil, depth of planting, date of planting, and the time and manner of harvesting are all carefully observed. In connection with these already named, it is also claimed that opportunity is offered to illustrate the good and bad effects from certain methods of cultivation; of working soil when in good and bad condition, with the consequent effects upon growing crops; the value of deep and shallow tillage; methods of conserving moisture; importance of fertilization; conditions essential to germination as well as conditions conducive to growth.

Now may not all of these claims be satisfied even in larger degree, if the attention is given to agricultural nature-study (the study of cereals, grasses, fiber plants, saccharine plants, plants bearing oleiferous seeds, etc.), rather than to the cultivation of flowers and common vegetables, with which most children are quite familiar? Again, would not a school-garden in which are cultivated wheat, corn, clover, alfalfa, flax, hemp,

sorghum, sugar beets, castor beans, etc., help to realize the demands of nature-study? We quote the "special purposes" of nature-study from the *Oshkosh State Normal School Bulletin* of May, 1906, designated "Nature-Study Number:"

> First, to provide discipline especially to the perceptive faculties leading to the cultivation of close and accurate observation. Second, to develop the right moral spirit leading to sympathy, kind treatment, and right feeling toward life, especially animal life. Third, the work should aim to develop the spiritual nature, leading to reverence, trust and belief. Fourth, to cultivate the aesthetic sense, leading to an appreciation of nature's beauty, including recognition of the beautiful, training in the securing of beautiful effects, and appreciation of the beauty of adaptation to use. Fifth, to arouse love of nature and desire for her acquaintance and companionship. Sixth, the work should help to maintain interest in all school work and aid in the work of other studies, especially language, reading, and drawing.

It is difficult to see why the cultivation and study of plants that administer to many of our physical needs may not "provide discipline for the perceptive faculties," "develop the spiritual nature," "cultivate the aesthetic sense," "arouse love of nature," and "help to maintain interest in all school work and aid in the work of the other studies," at least in as great a degree as is realized from the cultivation and study of plants whose beauty is their only excuse for being? The cereals and grasses have long been subjects for the artist and poet.

The advocates of nature-study lay stress upon training the feelings. Surely this is good pedagogy, and is not to be lost sight of in teaching any subject in any elementary grade. A present-day educator says, "The emotional spirit of instruction is the factor that counts." And is it not true that the emotional spirit can be aroused and developed by considering nature from the economic side, the human side? Is it not also true that the child should be introduced to nature in its relation to his life, to his needs? We recognize the value of the aims and ends of nature-study and of the nature-study garden. We believe that the selection of material may be in the interests of industrial and commercial geography, and at the same time contribute to the realization of the nature-study aims and ends. We also believe that nature-study may be so correlated with industrial

and commercial geography that each may aid in the interpretation of the other.

The first paragraph in the *Oshkosh State Normal School Bulletin* for May, the "Nature-Study Number," defines nature-study in the following terms: "In general terms nature-study is a study of one's natural environment. This study should be carried on in such a way as to bring about the most perfect adjustment of the individual to that environment, to the end of using it for the highest good. Nature-study is learning those things in nature that are best worth knowing to the end of doing those things which make life most worth living." We could ask no better definition, but this definition is often lost sight of in nature-study and in the selection of material for the nature-study garden.

The school-garden seems as necessary for the teaching of industrial and commercial geography as it does for the teaching of nature-study, but the selection of materials for the nature-study garden does not meet the demands of industrial and commercial geography; on the other hand, the selection of material in the interests of industrial and commercial geography would meet the demands of nature-study.

In considering the great human industries, agriculture and stock-raising are first in importance. These two industries place man's food supply on a permanent basis. It is a matter of history that men have not emerged from savagery until they have placed their food supply upon a permanent basis.

Our country holds the first place as an agricultural nation, and leads the world in the production of all varieties of livestock except sheep. Corn is our leading and most valuable crop, averaging over two billion bushels, and forming seventy-five per cent of the world's supply. Less than one-tenth of this prodigious yield is usually exported in the form of corn. The greater part is fed to livestock, especially cattle and hogs. Hence a large part of the corn crop is exported in the form of meat.

The school-garden should illustrate corn culture, pupils observing time of planting, care of the growing plants, and time of harvesting. They should note the time elapsing from day of planting to day of harvesting. They should note the char-

acter of soil best adapted for corn, and the effect of heat and moisture on the growing plants. An ear of corn partially husked is a good subject for the drawing class. The harvested ears should be used for schoolroom decoration. It will be recalled that some of our finest and most elaborate decorations at the Columbian Exposition and at the Pan American were made of different parts of the corn plant.

We lead the nations of the world in the production of wheat. The wheat crop in 1900 equaled 625 million bushels. Wheat is the most widely distributed and the most nutritious of the cereals. More than one-third of the world's population are consumers of wheat bread.

The school-garden should give space for the growth of spring wheat. The variety sown should be noted, dates of sowing and harvesting should be recorded, the period of growth determined, effects of heat and moisture observed, and insect pests, if any, studied. Since wheat is harvested in vacation, the gardener should note the time and report it to the class at the opening of school in September. The ripened grain should be used in decoration. A small plot of winter wheat should be grown and many comparisons made with spring wheat.

Our country is exceeded in the production of oats by Russia only. Our annual crop some years reaches one billion bushels. Oats should be cultivated in the school-garden, a careful study be made of their growth, conditions for growth, and comparisons made with wheat and corn as to growth and conditions for growth. How may oats be distinguished from wheat before the plants head?

Hay forms one of the most valuable crops in the United States. Its average annual value is 470 million dollars, coming next in value to the corn crop. It is of great importance in the cattle-raising states of the corn districts, and also in the dairy states, of which New York leads. "Hay" should include "timothy," clover and alfalfa.

The school-garden should make the pupils familiar with each of these forage plants, from the seed to the harvested plants. Note that under favorable conditions more than one crop may be harvested in a single growing season. Which will produce the

largest number of crops? Which is the most rapid grower? Which are not true grasses?

The United States is the greatest sugar-*consuming* country in the world, every person in the country using, on the average, seventy pounds a year. Our greatest import is sugar. The sugar which we consume is very largely cane sugar, which is considered the best sugar. But our beet sugar industry is gradually increasing, especially in California, Nebraska, Utah and Michigan. Two-thirds of the world's sugar product is beet sugar.

Sugar beets should be a product of the school-garden, also one of the common varieties grown for table use. The growth of each should be studied, likenesses and differences noted, the matured roots compared, especially in saccharine qualities.

Sorghum being a sugar-producing plant, also a member of the same family of which sugar-cane is a member, its cultivation would be of marked interest to the pupils.

Flax is one of the most important of textile fiber plants. It has a very wide range, thriving in the dry summers of California and in the moist regions of the Mississippi Valley. It grows well in the colder parts of Europe and equally well in tropical Asia. Although almost every American citizen wears linen garments, only a small quantity of flax is grown in the United Sates, and that quantity is grown for the seed which is manufactured into linseed oil.

Because of the importance of the flax in contributing to our clothing material as well as to the arts, it should be produced in the school-garden. Its beautiful blue flower gratifies the sense of beauty. Children should make brush drawings of the plant in flower and leaf. A firm, rich soil is the chief requisite for flax growth.

The true hemp of commerce (Cannabis sativa) is grown in nearly every country of North America, Europe and Asia. The prepared hemp is mainly used in the manufacture of wrapping-twine, cordage and coarse canvas. The hemp is a stately plant, growing three feet or more in height, and commands attention when growing. Hemp seed forms a part of the food of caged seed-eating birds.

Hemp should be found among the plants of the school-garden. Hemp and flax fibers should be compared in color, length, coarseness and strength. Children should learn how each fiber is best adapted to its use. Compare flax seed and hemp seed as to their oleaginous properties.

The United States is the largest grower of tobacco. In some sections of our country the cultivation of tobacco is the leading agricultural pursuit, and its preparation for use is the leading manufacture. It is a noble plant when growing, having a height of three feet, and, when left to reach its greatest growth, attains a height of six feet. Its leaves grow from one foot to two feet in length. Its flowers are two inches long and rose purple. Tobacco in our latitude must be started in hot-beds; a few plants may get a start in the schoolroom. Its culture in the school-garden may thus be practicable. Tobacco should be be set in the garden, north of plants of smaller size. The pupils will discover that liberal fertilizing is necessary for tobacco, and that it has its peculiar insect pests.

In some counties of New York hop-growing is a prominent industry. The hop is a graceful twiner, and may be trained over arches at intervals along the garden paths. Clusters of hops may be used in class-room decorations for the opening weeks of the fall term. Hops need comparatively little care, and yield good returns. The fact that the hop, as well as hemp, is dioecious, adds interest to its study.

Other useful plants that may be cultivated in the school-garden are broom-corn, sweet potatoes—which form beautiful vines—, peanuts, chicory—producing bright, blue flowers,—rye, barley and buckwheat. The herbs of the kitchen-garden are of interest because of their flavoring qualities and wholesome odors. Among them are sage, spearmint, white mustard, caroway, summer savory, coriander, anise, thyme, dill, fennel and sweet marjoram. Many of these enter into pharmaceutical preparations as well as into foods and confectionery. Some of them have pleasing foliage and pretty, although rather inconspicuous, flowers. Their cultivation is simple and their care trifling. Their cultivation extends the child's knowledge of useful plants. A handful of sage or of summer savory from a pupil might be as pleasing in his home as a handful of scarlet salvia.

There are many useful plants from the tropics that may be grown in tubs. Some of these are coffee, tea, orange, lemon, banana, pine-apple, rubber plant, date-palm and agave. Coffee as an import commodity in the United States is exceeded only by sugar. Coffee, sugar and tea are used in every home. The citrus fruits, bananas and pine-apples are found on every fruit-stand. One of the agaves yields a fiber (sisal hemp) from which Mexican hammocks are made. All of the tropical plants are evergreen, and many of them are cultivated as house-plants for their beautiful foliage. Plants of this order may be kept for geographical study, at the same time to add beauty to the school-garden, and variety to the plant collection. A study of these tropical plants shows their peculiar needs, and how they may be adjusted to new climatic conditions. If the school can not keep these tropical plants safely through the winter, then a local florist will care for them in his greenhouse for a small consideration. Sometimes a florist will rent potted plants for the season. But school ownership means greater interest.

A school-garden large enough to admit of trees should have at least one of each of our native conifers: white pine, spruce, balsam fir, hemlock, white cedar and tamarack. It may also have a sugar maple, box-elder (the ash-leaf maple), a sassafras tree, etc.

The matured products of the school-garden should contribute annually to the school-museum, and be used in geography teaching and nature-study whenever they will illustrate such teaching.

The classes in drawing will find wheat, corn, flax, hops, chicory, the caster-oil plant, clover, and many other plants of the school-garden both pleasing and profitable subjects for study. The artist prefers single flowers to double, and the more familiar plants to exotics.

Many school-gardens are too small for the cultivation in one season of all the plants here named. In such a case, let there be rotation. "We have raised wheat, corn, flax, sugar-beets, tobacco, and timothy this year; next year we shall raise rye, buckwheat, hemp, sorghum, hops and alfalfa." This will hold interest through change of material, which in turn requires change of methods of cultivation.

The plan of the school-garden must be determined by the kinds of plants to be cultivated; and the size of the plots must be determined both by the size of the garden and by the number of kinds of plants to be introduced.

Summary. The relating of school-gardens to industrial and commercial geography would more nearly realize the aim which led to their being opened. Such relation would still furnish opportunity for the nature-study work, and also correlate nature-study and geography, thereby saving time and energy in teaching. Nature-study and geography have in common much literature, art, manual exercises and museum specimens. The two have field excursions, and use the brush, the crayon, and the molding board to express ideas. In at least one school, Tiffany's nature-study cabinet furnishes material for geography oftener than for nature-study. The school-garden as suggested in this paper would require far less outlay of time and money, and require less care than the nature-study garden planted to flowers. Under the right teacher—and no school work "goes" unless under the right teacher—the emotions would be exercised on a high plane, the plane of patriotism. Many nature-study advocates overlook the utilitarian idea. This idea is thought to be sordid; but in this practical age, the utilitarian idea can not be lost sight of. The aim of education is or should be to develop the socially efficient citizen. The first requisite of the socially efficient citizen is that he be able to "pull his own weight," that he be in no wise a drag upon society. A long step will be taken toward the development of the socially efficient citizen when the school-garden is related to industrial and commercial geography.

CANADIAN DEPARTMENT

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GARDENING FOR SCHOOLS

This is the title of a recent bulletin by Professor Mc Cready of the Macdonald Institute, Guelph, Canada, (Bull. 152 Ontario Agricultural College, December, 1906). The author is of the opinion that Ontario teachers and people are not ready for the formal, organized garden. He says: "Investigation on the subject of school-gardening throughout the province forces us to the conclusion that neither the country nor the teaching profession is ready for undertaking it." Practically no schools, outside those under the special care and patronage of the Macdonald Fund, have taken up the work. As to the reasons for this apparent lack of interest in school-gardens, Professor Mc Cready writes:

"It is not possible to suddenly graft part of an educational system of one country on to the system of a country very different. Educational systems are expressions of national tendencies working through many years. They are shaped by many forces, political, racial, industrial and religious. These tendencies and forces leading to the introduction of such things as manual training, gardening, etc., into our primary and secondary schools are not acknowledged at the present time by many in our Province. Or at any rate, the acknowledgment has not reached the point of adoption and establishment. The truth is, there has been very recently great changes in educational aims, methods and equipment, to which we have not adjusted ourselves. We will probably be the better for making any new adjustment that has to be made, slowly. Over zeal may work ultimately to less and slower progress than guarded procedure.

The ordinary rural school as at present constituted can not very well nor wisely undertake a school-garden. The subject deserves better than hasty, inconsiderate adoption. There are many difficulties to face; there are indifferent parents, antagonistic trustees, unprepared and changing teachers, crowded programes of study, and the unsolved summer vacation problem.

It will be well to go slow; we can do naught else in comfort and safety. The time may come when the country school becomes a centre for the spread of the arts and sciences in its district. It will have a teacher's home in connection with it, and the tenure of the teacher's office will be for his life. Or it may be that the consolidation of schools will raise the school to its proper place. In either case, the school-garden will be part of the equipment. We are not dealing with a possibility, however, but with a condition."

Professor Mc Cready believes that for the present the best form of work that can be undertaken is home experimental plots and home gardens in connection with the Ontario Agricultural and Experimental Union which has its headquarters at the Ontario Agricultural College. Such home work will, he thinks, lead in due course to school plots and school-gardens. The scope and aims of the Experimental Union are outlined, and followed by a list of the experiments for 1906 in field Agriculture Forestry and Horticulture. While agreeing in a general way with the views so admirably expressed in the bulletin, the reviewer is of the opinion that the system of home gardens and home experiments would tend to isolation of the worker from his fellows and to consequent lack of interest in his work. The enthusiasm which is aroused when a number of children are working together would be wanting. Enthusiasm is a good thing in school effort and should be strongly encouraged. Again, when children work independently at their homes, a spirit of rivalry of the wrong sort is set up, which would tend to keep the workers apart in sympathy. Co-operation and organization for a common good are woefully lacking among farmers; and the school-garden, with its common plots, should be a means of fostering and cultivating the very traits which are so much needed for the welfare of the community.

With regard to the long summer vacations, Inspector Cowley says:

"There is no insurmountable difficulty or serious problem in keeping the school-garden decent during the long summer vacation. Even if the garden were to deteriorate from neglect during holidays, the fact will be of altogether minor consequence against school-gardens, since a well-ordered pupil rather than well-ordered garden is the supreme end of it all. If the pupils do not provide for their plots during the vacation, by all means let the weeds grow.

The worst possible mistake in such a case would be to pay a janitor or some other person to take care of the plots for indifferent and unmindful pupils. At some school-gardens in Carleton County last summer some pupils returned after vacation to weed-choked plots in which their flowers and vegetables compared very unfavorably with those of their diligent companions. Their silent observations of this fact, and their strenuous efforts to redeem their plots, impressed upon them a lesson of moral and material value.''

Active membership in the Experimental Union would undoubtedly be an excellent thing, but it should be supplementary to the efforts at the school. It would strengthen the hands of the teacher, and bring vividly home to the parents the value of school-gardens.

The bulletin is a most excellent and timely publication, and will no doubt be of much service to the schools of Ontario.

W. LOCHHEAD.

NATURE-STUDY IN RURAL SCHOOLS

BY A. B. GRAHAM

Professor in Agricultural College, Ohio State University

The old saying, "Things seen oftenest are seen least," applies quite as well to the very common things in nature as to the things of art. Because children are reared in the country or country villages is no evidence that they have become acquainted with common things about them.

There is no one who is not willing to testify that real pleasure is experienced from just a slight acquaintance with those things of nature that are so near us. The roadside, the rock-pile, the narrow stream, the woods and other places contribute something that reveals much of the handiwork of our Creator. The pleasure of the moment passes into joy which is abiding.

We should learn to know nature, that we may the better understand the relation and dependence of one thing upon another: the animal whose life is dependent upon the plant for food; the plant that must depend upon the animal for seed distribution; the fertilizing of plants by insects that visit them; the place for the common fly and ichneumon to lay eggs; the exchange of carbonic acid gas which is produced by animals, for the oxygen which is given off by plants, etc., etc. In short, to furnish a basis for the future study of ecology.

In literature many allusions to nature are made; nature furnishes material upon which many very forceful rhetorical figures are based. The reader selections are read with much more pleasure and are understood much more easily from knowing nature.

Nature-study furnishes much material that may be used in drawing exercises. What is learned from very ordinary observation also aids in criticising drawings and statements made in literary selections.

In the rural school, where there is a crowded program, every minute of the time must be used for some definite purpose. It must not be forgotten that the regular studies are to have pri-

mary consideration and that nature-study as such must be secondary or incidental to the recitation. Too often there is an entire wandering away from the subject of the recitation. The nature-study enthusiast often permits himself to be drawn away from the regular lesson by irrelevant although important questions asked by the children.

In the field trip, which may be only a school-yard trip or a short walk down the road, nature work is of primary consideration. Occasionally in opening exercises, or in the Friday afternoon half-hour the observation lesson should have the right of way.

Since not as much time can be given to following any nicely planned, suggestive outlines in reports, books, etc., the most should be made of such time as is available, and every opportunity that presents itself to the teacher should be utilized. Experience has led the writer to believe that observations that were in the main incidental to the regular school work have created a love for nature quite as genuine as comes from following a hard and fixed plan. While nature work in the grades should arouse an interest in the further study of the natural sciences, it must not be forgotten that something must be left for the high school. We teachers owe it to ourselves as much as to the children to be quite as well informed as possible, but, at no time should we be above being a learner, or in the attitude of a learner, with the children.

The regular reading-lessons furnish much material for confirmation, criticism, and questions. A few lines from a second reader in general use will be suggestive:

"Twinkle, twinkle, little star."

Do stars always twinkle? Look at a very large, bright star, then look at small ones.

"For you never shut your eye,
Till the sun is in the sky."

What is meant by the star shutting its eye? Do stars shine in the daytime? If so, why can't we see them?

"Spots of red dot his head." What are these spots?

"Three small pairs made of hairs." How many would three pairs be? How many feet has a fly?

"Spiders never use flies well." How do they treat them? Have you ever watched a spider sitting quietly on his web?

"The strange cat took the little kittens, one by one, and carried them to the attic." How did the cat carry the kittens? What other animal carries its young in the same way? (See lesson, page 68, Mc Guffey's Eclectic Second Reader. What other characteristics are common? Such an exercise forms a basis for a classification).

"And they caught the little mousie,
Long time ago."

Are kitty's claws always out of the soft paw ready to catch or scratch? Are a dog's claws always out?

"The kingbird eats flies, etc." Watch him fly from a fence-stake or limb, out into the air and back. What is he doing?

One might continue making abstracts from readers more advanced, but they would only serve to emphasize the idea already presented.

Another feature of nature work is found in making reasonable criticisms of statements. But this work can be carried on to such a degree that children look for more that calls for unfavorable rather than for favorable criticism. A few examples will suffice:

"Cowslip, daisy, violet,
In their leafy beds,
All among the grasses
Hide their heavy heads."

Do cowslips, daisies, and violets lie in leafy beds? Do any of these hide their heads?

"One fine day in July, she sent George to the woods; * * * While he hunted about the bank, he saw among the moss some fine wild strawberries." Do strawberries ripen in Ohio in July? Are they found among moss?

Another very interesting exercise is in making a study of pictures to find out whether or not the artist drew them correctly.

In one reader the spider's web is drawn in a way that the web is shown to be made up of concentric circles. Is that correct?

The Geography Class.—Next to the reading classes, the geography class is probably the best. The variety of temperatures, water forms, wind, and causes for soil formation, together with experiments to demonstrate, make very interesting work for the year, as well as for the beginning weeks of school. The ant and the fishworm are too important in the work of soil mixing to be omitted. A simple study of the habitat of plants will bring into consideration those water plants that help to change the courses of rivers or assist in filling up lakes; more or less should be learned of plants and trees that indicate soil conditions; insect friends and foes come in for mention, if not for study, in the lessons on local products.

For a little observation trip the school yard, roadside, a nearby wood or stream should furnish ample material for several noonday walks. Objections on the part of parents may arise because a teacher has failed to keep children properly in charge, but, more often, objections are made because of prejudice against doing a thing. Be diplomatic; be patient; be persistent.

Opening exercises and the Friday afternoon period should be for all. The little ones may not get much, but many times they get more than a few older ones.

The language class has not been mentioned as a place for the study of nature. It may be so considered if expression is to assist in impression.

Make the so-called nature-book your servant, not your master. Don't be discouraged because you think you have done only a little that might pass as nature work. If you will take the time during the last week of school to make up an orderly arrangement of the work gone over, you will be much surprised. Many years of experience have caused the writer to believe that the ability of elementary children to observe carefully is quite as well established as when the plan has been prepared and followed with care and pains. [*The Ohio Teacher.*]

NOTES FROM PAMPHLETS AND MAGAZINES

Poisonous Snakes of U. S. A pamphlet (price 10 cts.) with this title has been published by Mr. Ditmars, Curator of Reptiles in the New York Zoological Park. It gives descriptions, habits and distribution of the numerous species. The various species of rattlesnakes found widely distributed; the copperhead of Eastern States; the water moccasin of the Southeast; and the coral snake of the Gulf States—this is a full list of our poisonous snakes. In the New England and Middle Atlantic States there are only the copperhead and the timber rattlesnake. The blacksnake, water snakes, flat-headed "adder" and others popularly dreaded are *absolutely harmless*

Contradicting enormous popular beliefs, the author tells us that the snakes never spring at or chase an enemy, and a rattlesnake can strike without coiling, and extracting the fangs may cause new ones to develop within a few weeks.

Full directions for treatment of snake bites are given: applying ligature above the bite; cutting the punctures to cause flow of blood; sucking out blood; washing with water containing a few crystals of potassium permanganate; injecting antitoxin, brandy and strychnine as stimulants; taking a cathartic; avoiding *blood poisoning*—these are the stages of treatment advised. All persons going into regions where venomous snakes abound should first read this pamphlet and provide themselves with the necessary articles.

Report of the Audubon Societies. President Dutcher's report on the 1906 work of the National Association of Audubon Societies fills sixty pages of the December *Bird-Lore*. It deals with legislation and enforcement of laws in various States, bird reservations, educational work and suggestions for future work. Every reader of THE NATURE-STUDY REVIEW who has even a mild interest in the protection of our native birds should read this report. A copy of the December *Bird-Lore* may he purchased for 20 cents from newsdealers or from the publishers at Harrisburg, Pa.

War on Game Butchers. All true naturalists will heartily support Mr. G. O. Shields, President of the League of American Sportsmen, in his continued activity against hunters who butcher game in and out of season. Any one really interested in wild animals will cease to be indifferent concerning the enforcement of the game laws if he reads the editorial notes in *Shiela's Magazine*. Its boldness in publishing names and pedigrees of all who are

caught violating game laws or ruthlessly butchering wild animals is very commendable. In addition to this editorial work, Mr. Shields has taken an active part in the campaign against the Italians who shoot song birds near New York City, and many arrests have for a time stopped the shooting.

Burbank's Experiments. In a review of Harwood's "New Creations in Plant Life," (an account of the work of Luther Burbank) the *Plant World* states that those competent to judge agree as to the value of much of Burbank's work in plant breeding, but in justice to the workers who have preceded and are contemporaneous with Mr. Burbank, we should not permit ourselves to over-estimate these services or to be influenced in our judgments by the fulsome adulation of such writers as Mr. Harwood. Blinded by the glamour of Mr. Burbank's truly remarkable achievements, the public is apt to overlook the labors of such men as Vilmorin, Crozy, Eckford, Bailey, Webber, and a host of others whose results are equally important and far-reaching and, in some instances, indeed, more so.

Concerning Mr. Burbank's methods of work, it is a distinct disappointment to learn from this book that he keeps no exact records of what he performs, but that in his hybridizing experiments he neglects the first and paramount essential for success,—the taking of precautions to insure genuine cross fertilization and to avoid contamination from foreign sources. The pollen of the same species is almost invariably prepotent over that of another species, no matter how closely related. Yet according to his biographer, Burbank takes no pains to insure the purity of a cross. "Mr. Burbank . . . says that it is wholly unnecessary in ordinary plant-breeding to attempt to cover the flower with a screen of tissue paper or gauze." He adds, with unconscious irony, "If the pollinating has been thorough, nature may safely be left to do the rest." It is hardly necessary to point out that a flower treated in this way may be visited by insects bringing pollen from many different sources, and that the parentage of the resulting seedlings must remain absolutely in doubt. It is quite true that if these seedlings show the characters for which Mr. Burbank is working, the results are satisfactory from his standpoint; but what of their scientific value? What new fact have they added to our knowledge of plant breeding? How can the experiment be repeated? The fact that a new fruit *has been* produced is of general interest; it might never be improved or perpetuated if science did not discover *how* and *why* it originated.

An article in the *Century Magazine*, by Professor De Vries, author of famous books on plant breeding, contains essentially the same criticism as those quoted above.

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DEVOTED TO ALL PHASES OF NATURE-STUDY IN SCHOOLS

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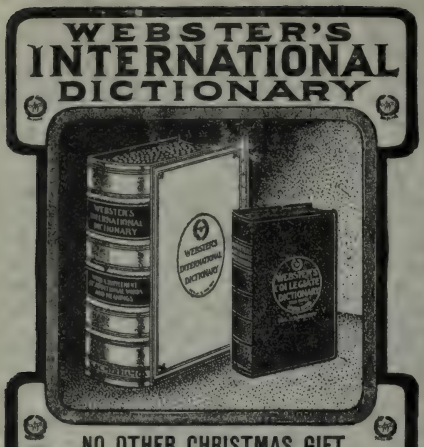

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THE
NATURE-STUDY REVIEW

DEVOTED TO ALL PHASES OF NATURE-STUDY IN SCHOOLS

VOL. 3 APRIL, 1907 No. 4

CANADIAN DEPARTMENT

EDITED BY PROFESSOR W. LOCHHEAD

Macdonald College, Ste. Anne de Bellevue, Quebec

[All communications concerning this department should be sent to Professor Lochhead at the address given above.]

NATURE-STUDY DEVELOPMENT IN ONTARIO

In the year 1900, when the author first became superintendent of the public schools in St. Thomas, Ontario, nature-study, though common enough in Manitoba and in Nova Scotia, as well as in many of the States of the Union, was just beginning to arouse curiosity among Ontario teachers and educators. Circumstances in St. Thomas forced the subject rapidly to the front, and its development was directed almost entirely by local conditions and may, therefore, be considered natural. In September of 1900, a course of nature-study was outlined for the St. Thomas schools, very much as it appeared in Morang's "Modern Nature-Study" in 1902, so that this outline of work preceded the regulations of the Education Department by four years.

Nature-study was thought of first as a substitute for object lessons, which, though occupying a place on the outline of work for the public schools, were not used by more than one teacher out of forty on the staff. Object lessons as we all know appealed to the senses of the pupils, chiefly to the eye, but were usually associated with such subjects as cork, glass, rubber, etc., the products of foreign countries or of factories beyond the observation of the teacher and pupils. It was a natural step to substitute the living plants and animals of the immediate vicinity for these lifeless products of a far away community. Suffice it to say that nature-study was substituted for object lessons.

One of the first features of the movement was the securing of about one hundred mineral specimens of Canada for each of two twelve-roomed schools. These were donated by the Dominion Geological Survey Department and were the first specimens ever given to public schools, though quite common in high schools. These minerals suggested a museum and museums began to develop, resulting in three fair museums in which are to be found minerals, birds, mammals, insects, plants and historical specimens.

However, these were lifeless things still, though pupils were naturally interested in the living specimens by collecting for their museums. Some teachers began to observe the preference of children for the living things and plants were brought into the class-rooms, and two or three teachers planted seeds and raised plants from them in pots. Larvæ of insects soon became the most common kind of specimens brought in and children became intensely interested in the weaving of the cocoons by the larvæ of moths. The first moth to emerge from these was the beautiful cecropia emperor moth. It is hard to say who were most interested in this wonderful creature, the pupils or the teachers. At any rate the teachers took the trouble to carry the moth to the inspector for his examination.

Work along this line of studying the life-history of insects, frogs and birds, continued without much change until 1904, when in March of that year, the question of distributing seeds to pupils was discussed by the teachers. The idea was obtained from Hodge's "Nature-Study and Life," one of the best books on the subject yet published. It was decided to distribute seeds, with a view to holding an exhibit on June 24, 1904. Folders were printed giving a few simple directions and requiring a record of growth. So few kept any record that this plan has not been followed since. The plants did not develop as rapidly as the authority said they would, consequently on June 24th, there were very few plants far enough advanced to be worth exhibiting. However, they were brought to their respective schools and photographed. Over five hundred plants were exhibited.

In the spring of 1905, seeds of both flowers and vegetables were distributed. The choice made was as follows: Grade 1, nasturtium and parsley; Grade 2, pansy and sweet corn; Grade 3, centaurea and sugar beet; Grade 4, phlox and celery; Grade 5, peanuts (canadian) and verbena; Grade 6, asters and catalpa; Grades 7 and 8, cosmos, asters and broom corn.

On September 22, 1905, a flower show was held in a large store, each school arranging its flowers and vegetables in a space assigned by the committee. The result was a pronounced success from every point of view. The exhibit was beautiful, the teachers, parents and children were delighted, and the attendance was greater than the capacity of the building. The net proceeds were devoted to beautifying the school buildings.

In 1906 another exhibit was held in connection with a more pretentious exhibition, the "Made in St. Thomas Exhibition." A program of songs and drills was put on and the attendance was in the thousands. In fact, it was too great a success, the flower and art exhibit being almost eclipsed by the program attractions. As an educational factor, the exhibit of 1905 was the greater success, and future exhibits will take it as the ideal.

In 1905 three schools prepared plots on the school-grounds. These were very successful and proved the most valuable nature-study feature so far developed. This year every school had its school plot in which the whole school was interested. The flowers on these plots are used to send to pupils who are absent through illness. In this way the home and the school are brought more into touch with each other.

The preceding results are the direct and visible products, but there have been indirect and permanent results of much more value than these, due to correlation with other school subjects, composition, drawing and color work and geography. The remainder of this paper will deal with the subject of composition.

After the exhibit this year, prizes were offered for the best compositions on the raising of plants this year, with a view to discovering what had been learned. The prize was independent of spelling, writing or language. The pupil who had learned most and could express it was considered the winner. Without doubt, the compositions were decidedly superior to the average composition. Here is one by an eight year old boy, with the spelling corrected.

"I planted my plant behind the gate and it growed up high. The next month it still keep growing high and high. I cared of them myself. I water them every day, and then I put them in a box. The flower was not very high. I had a garden of my own. Papa gave me the seed. He said it was no good. But I planted it and it growed. He said it was no good. When he saw it after a while he thought it was getting a little better. He began to say it was swell.

I thought that was the time that he got fooled. I took and put it in the sun and then I cared for it. One time I got scart. It didn't seem to grow one bit. I watered it about two times. I had been watering it two much and the leaves begun to fade. Then I thought it was a goner."

Another pupil in the 4th grade writes: "I was interested in my spinach (beet). I cut it off but not to the root and it came up three times. Everytime I cut it off it would come up again and I took good care of it myself, and spinach (beet) has a big leaf and we had two or three meals off it and it came up again. I learned about my spinach."

The compositions go into all details about the work required in raising the plants as in the following: "I got some seeds of beets and cosmos at school. When I got the seeds I first went to the greenhouse to get a flower-pot. I then dug up enough earth to fill it, then mixed some manure with it, then when I had done that, I made it very fine and sifted it, then put it in the pot and put a little water on it, then took a stick and made a small hole in the middle of the pot, about one and a half inches deep, got the cosmos seed and put four of them in."

Not to weary our readers with commonplace compositions of doubtful value, I shall close by quoting from two or three of the eighth grade compositions, to show that valuable moral lessons are learned from nature-study. One girl says: "I was quite proud of my flowers but there were many more beautiful flowers. I wondered if the other girls and boys had misfortunes and joys and anxieties like I had. But after all it taught me some good lessons. It taught me that we have to have misfortunes, patience, work, carefulness and you get rewarded at last with a red ticket."

I have no doubt this girl really learned these lessons. What more could a teacher wish to accomplish with her pupils?

A boy planted some broom-corn in two ways—in hills and broadcast. He says: "I tried to see which would grow the fastest and I soon found out. The seeds that were in hills grew fastest. I planted seeds in the hills out in the sun and the rest under a butternut tree. The stalks that were under the tree are weaker than those in the sun." There are two facts, well worth knowing learned by experiment. That boy developed considerable brain power along with his gardening.

I have in my possession one composition of five closely written

pages on "Cosmos," by a girl who brought to the exhibitions each year cosmos plants in pails. These plants were in bloom and stood five feet high. Another girl wrote two pages on the cultivation of "Sweet Peas." Among other things she says: "This has been my first attempt at planting school seeds and I am very happy to think that I had such good success. My sweet peas are blooming yet, while the little girl who lives next door has not had any since early in the spring. * * * Sweet peas are my favorite flower and I often wished to have some and now I have had my wish gratified."

The object of this article is to convince teachers that the school-garden is the most valuable educational equipment at the teacher's command. Expensive scientific apparatus, globes, maps, and other desirable things are "trifles as light as air" compared with the garden, where pupils must labor to produce results Make a school-garden this year.

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THE FOUNDATIONS OF CHEMISTRY IN NATURE-STUDY

III Oxidation in and by the Air

[The first article of this series was published in THE REVIEW for Nov. 1906 (Vol. 2. p. 278); the second in Jan. 1907 (Vol. 3, p. 19.)]

The children can now see that just as carbon and water disappear when they combine to form wood (Lesson I. N. S. R. Nov. 1906. pp. 278-281) so carbon and oxygen gas disappeared by combining to form not a solid substance but a gas—carbonic acid gas composed of the carbon and oxygen chemically united (Lesson II. N. S. R. Jan. 1907. pp. 20-21). The question will naturally arise here as to whether any new substance is produced when charcoal burns in the *air*, and whether it is the same substance we obtained by burning carbon in the bottle of oxygen.

Let each pupil char the end of a dry stick, set it on fire, and hold inverted a wide mouth bottle for a minute or less a short distance above the flame to catch any invisible gas which may arise from the flame, then cover the mouth of the bottle with the hand, quickly empty a little lime-water into the bottle, and shake it through the gas, still keeping the mouth of the bottle closed. Shake lime-water through a bottle of air and note the difference in the result. A full and free discussion will lead to the conclusion that when the charcoal

of the wood burned in the air carbonic acid gas—a compound gas consisting of carbon and oxygen—is produced, that the wood supplied the carbon which entered into this gas, but that the oxygen must have come out of the surrounding air just as it came from the surrounding oxygen when we burned carbon in a bottle of oxygen; and since the burning carbon got oxygen out of the air, the air must contain oxygen. And so it will appear that when carbon is burning in the air it is undergoing oxidation. Attention should be called to the fact that this union not only produces an *oxide* which may be caught in a bottle, but that it is accompanied by *heat* which may be felt, and by *light* which may be seen.

Next, try to burn a piece of glowing charcoal in a bottle of air. It will not glow and burn brightly as it did in a bottle of pure oxygen, but soon becomes cold and black again. The children will conclude that the air must contain, besides oxygen, some other gas in which charcoal will not burn. They may be told that this gas which prevents substances from burning as well in the air as in pure, or nearly pure oxygen, is called *nitrogen*.

Let the pupils take a little lime-water to their homes with the request that they will try to find by catching in a bottle the gas from a coal or wood fire whether carbonic acid gas is produced by the fire in the stove. Their results should be discussed at school and the questions proposed: Why we burn wood and coal in stoves—whether for the light, the heat, or the carbonic acid gas produced? Whither does this gas go and how?—how does the wood or coal obtain oxygen in a closed stove?—and why does the burning become slower when we close the draught?

On the evening before the next lesson the children may be asked to try to char (not burn) small pieces of bread, potatoes, sugar, meat and other food stuffs, on a hot stove, and to eat for breakfast some of the articles of food in which they find carbon.

At school the problem will be to find whether the carbon in these foods is oxidized in the body as the carbon of wood and coal are in the stove. Now, if the carbon of the food unites with oxygen in the body, carbonic acid gas should be produced and may be caught in a bottle. The enquiry may be made more dramatic if the teacher will get a pupil before the class to blow his breath, by means of at tube, through a small bottle of lime-water. When the lime-water whitens, the children will see that the carbon of the food taken into the stomach appears in the breath from the lungs as an oxide of car-

bon—carbonic acid gas. This will be one proof that the carbon of the food unites with oxygen in the body. But we have found that this union before (in the stove, etc.) was accompanied by light and heat. In this case no light appears. Let us inquire whether heat is produced by the oxidation of carbon in the body. By breathing closely against the bulb of the school thermometer, the teacher can show that his breath, and, therefore his body, is much warmer than the surrounding air. He can then show that inanimate objects in the room, as water, desks, etc., in which no oxidation is going on, are no warmer than the air. It will then be plain that the oxidation of carbon in the body produces heat to keep the body warmer than the air. So it seems that oxidation always produces heat, but sometimes no light. Next, must be found how the carbon in the body obtains oxygen with which to unite, and the number of inhalations per minute should be counted. Every pupil should be allowed to test his own breath for carbonic acid gas. Finally the children may be asked to make an off-hand sketch of a human body with a piece of carbonaceous food entering at the mouth, the body when the oxidation is going on at a temperature of 99 degrees while the air outside is 10 degrees below zero—with oxygen entering by the nostrils about 18 times a minute and carbonic acid gas escaping by the same opening at every expiration.

Thus ends an attempt to show how the beginning of Chemistry, as they may be developed in nature-lessons, without formulas or equations, may be used to train the pupils of the common school to observe and reason, and in later life may help them in fitting together intelligently their lives and their environment.

UNIVERSITY OF NEW BRUNSWICK
FREDERICTON, N. B.
JOHN BRITTAIN.

NATURE-STUDY AS AN EDUCATION [1]

BY MARY PERLE ANDERSON

Research Student at the New York Botanical Garden and Teachers College, Columbia University

During the last score of years, nature-study has been exploited in this country in various ways. It began as an off-shoot of the so-called object-lessons, such as were introduced by Dr. Sheldon into the Oswego Normal School and received further stimulus in the Cook County Normal School under Dr. Francis Parker and Mr. W. S. Jackman. The latter attempted the first formulation of nature-study as a distinct subject, and prepared a text-book of numerous isolated suggestions for the teacher, these suggestions ranging through many subjects and sometimes going far afield; but still the key-note of the book, as stated by the author, rings out strong and true: "Let us place the children in the woods and fields that they may study nature at work."

About the same time (1889), Mr. Arthur C. Boyden of the Bridgewater Normal School, championed the new idea, began teaching in the state-institutes of Massachusetts, and published a pamphlet on the "Study of Trees in Plymouth County;" one of the first of a long series of fluttering nature-study leaflets by men and women who, knowing much or little or nothing at all about the subject, have found the theme a good one to write upon. At the same time, also, a department of nature-study was organized in the Summer School of Cottage City under the name of elementary science. In the latter part of the eighties, nature-study under the name of elementary science was receiving consideration in many schools in several states.

From 1890 to 1895 exhibits of nature-work were common in cities, the display at the World's Fair in Chicago being the culmination of this phase of development.

About ten years after the introduction of elementary science into the grades, two men came forward to whom children will be grateful for centuries to come. Of all the numerous writers who have con-

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[1] Read before the Convention of the New York Botanical Garden, January 23, 1907. Published simultaneously in the *Journal of the New York Botanical Garden* and THE REVIEW.

sidered nature-study from one standpoint or another, the principles set forth by Professor Bailey of Cornell and Professor Hodge of Clark University are as sane and practical as anything that has yet been presented. To little people shivering over their first experience in the clear, cold atmosphere of science, a milder temperature and more genial climate were eagerly welcomed.

This meeting of the cold and warm currents, however, resulted most naturally in a fog from which we have at last emerged into a clearer, brighter sunshine than we have known before. During this unfortunate fog—the confusion in regard to the real province of nature-study—it was the privilege of anyone to enter the game and pin a tail on the donkey. When the fog lifted, the result was incongruous and ludicrous, for the tails were many and varied and some did not even hit the donkey.

There was the primitive-life literature including the marvellous "Story of Ab;" there were Kipling's "Jungle Stories" and the often beautiful and inspiring stories of Thompson-Seton; there were the fascinating tales of the wilderness as told by Long, and the delightful life-histories of Wabbles the song-sparrow and Bismark the red squirrel as recorded by Walton the hermit of Gloucester; all these were pinned to the curtain together with the works of Burroughs and Thoreau and the great nature-poems of the ages. There, too, were all the elementary botanies and zoologies of the day and some of the more technical literature of Bailey's "Integument-man" These with a few books on general nature-study and a multitude of treatises of all sorts and conditions on specific lines of nature-study added to the diversity and complication, and so long as the fog lasted, and there was more or less squabbling among those who entered the game, it is not strange that the wonderful growth following the introduction of nature-study received a set-back until the ideas of the average teacher could become more definite as to material, and those of the average principal of the grades more clear as to the scope and place of nature-study in education.

While there is no doubt of the constant advance of nature-study over the country as a whole, yet the gain is not the mushroom growth of the first few years, and this is well. There has been lack of fibrovacular tissue, and in more than one place nature-study has been dropped after a trial. This has occurred in a few large cities where the problem is most difficult, or where the school-board has failed to recognize the value of nature-study as a means of education, or in some cases where the teaching has been inadequate.

Nature-study, then, has already passed through various phases with us: first came the experiment followed by the exhibition which so inspired the on-lookers that it straightway became a fad; then came the period of reaction and criticism when nature-study became less serious —more of a reaction—and here came the opportunity to run in the unusual, the exceptional, the sensational in nature-literature (which is not nature-study at all, although it may be very good literature); and now our leading lights tell us that nature-study is an idea, an atmosphere, an attitude—in a word, it is spirit.

This then is the promise of the future, and our prophets prophesy wisely and well; but we cannot hope for any universal fulfilment of the prophecy for several generations to come,—not until there has been time to train our teachers, and they in turn have had the opportunity of training the children who are to be the parents of the next generation. Not until this time is reached can we hope to find many parents who will not destroy that beautiful thing to which we look forward,—the attitude, the atmosphere of nature-study which is an inherent part of the nature of the normal child. He inherits from ancestors remote a primitive love of nature and every natural object. Any child of three years turned loose in a small space where there is good clean dirt with worms in it, and pebbles, where green things are growing, where the chance caterpillar and toad and small snake are free to come and go, has amusement for a summer. Some one has well said:

> "Out-doors, God amused him; in-doors his mother;
> And the finite can never satisfy as the Infinite."

It is only when the child learns from others that he must not touch the toad for if he does he will have warts, when he hears that the harmless garter-snake is a poisonous reptile, and that the caterpillar will bite, only then is his faith in nature shaken, the nature-study atmosphere darkened, and the nature-study spirit hampered.

Dr. M. T. Cook says that while in Cuba he frequently gave his little one-year-old son small snakes to play with, and the child considered them the nicest kind of a plaything until at the age of four when he began to run with other children. In a short time the boy became afraid of snakes and is still afraid of them. Professor Hooker of Mt. Holyoke College had a little visitor whom she found it hard to entertain, so she brought out some little snakes from a

fernery. "Would you like to see my little friends?" she asked. The child was delighted and played with them happily until she heard some one call them snakes, then she dropped them in fear and disgust.

A child in the first primary grade of the University School for Girls in Chicago brought a tiny leafless twig to her teacher and asked her to use it for the nature-study lesson. The teacher thought it a rather small affair for a class, but a leaf-bud or two offered suggestion, and the teacher held out for what seemed to her a very creditable length of time and then turned with relief to a gay picture of an oriole on the wall. But the children did not want orioles in pictures on the wall; they wanted a little live twig, and the small girl who had brought it in raised her hand and asked severely, "Why don't you go on with the Nature-science?"

That which we are to aim for, then, we have at the very beginning; but by the time that the child goes to school he has lost more or less of it, and it is more difficult to restore it in a soil that has been sterilized than it would be to start anew in fresh soil. Allowing for individual exceptions, I have found it true that interest in nature-study in schools where the subject is not a vital one varies inversely with the age of the children, and that the difficulty in exciting an interest varies directly with the age.

The problem that confronts us is, how shall we recover that which has been lost; how shall we reach the pervading atmosphere that colors, the idea that permeates the whole life, the nature-study spirit. The child of the graded school has many teachers. It is a chance if he ever has one who really understands and fully comprehends just what Bailey means by atmosphere and attitude and idea and spirit. It is possible that one may be all this and that the school may have the spirit and never know it. I am not sure but this is the essence of the whole thing—the spirit free because unconscious of itself.

At one of the State Summer Schools held in Bennington, Vermont a young teacher came to me and told me how much she regretted the impossibility of having any nature-study in the little rural school where she taught. "The parents are not willing that the time should be given in school," she said, "the programme is already crowded, we have no money with which to buy books. But," she added, "there is a little brook back of the school-house, and the children and I stay out there about all the time at recess and noon

and we all go early in the morning before school. We have a series of pools, and in them we have several kinds of fish, and in one pool we have some salamanders, and in another turtles, and in another pollywogs. We feed them and keep the pools in order and the children do have such a good time. Then once a little house-wren came into the school-house and built her nest on the stove-pipe by the chimney, right in the schoolroom. And the children would keep just as still as possible so as not to disturb her."

This dear girl assured me over and over again with tears in her eyes that she would be so glad to have nature-study in her school, but that it was simply an impossibility! This illustrates how difficult it is for one to grasp the real significance of the study as presented by even so plain and simple and straightforward a speaker as Professor Bailey.

Atmosphere is intangible at best, and not an easy mark for the inexperienced. One may be sure the arrow will hit somewhere, even if sent at random, and many of our public-school teachers have evidently taken refuge in this thought, and the result is random and haphazard. The result would be the same and perhaps the idea might seem more definite if, with the idea of attitude as the ultimate goal we should begin by aiming at some nearer mark. To inspire the boys and girls with a vital rational interest in their immediate natural environment—an interest that shall continually widen with the circles of growing experience and knowledge founded on experience, and so lead to a wider environment—this is concrete and feasible.

In the country there is such abundance of material that the question is one of choice; in the more cramped conditions of the larger cities the question of choice is largely eliminated and here it is necessary to seize upon every natural object that comes within the reach of the children and to widen their pathetically limited environment by constantly reaching out, always from something they have seen or experienced, to the things beyond, and thus to inspire them with a desire to learn what lies outside the few blocks which immediately surround them. Settlement-workers tell us that most children in the crowded tenement districts seldom go beyond the dozen blocks which supply the necessities of life. A little girl of nine years was taken to the country for the first time. She was amazed beyond measure; she had attended the public-schools, but she had never been told that the earth was not paved all over, and it had never occurred to her that it could be any other way.

Let us teach the children to love the parks, not just as nice places in which to play but as places where one can know the trees as individuals that in time may become one's comrades and friends. To know the trees that are in our parks, to know them by their outlines and buds and twigs and leaves and flowers and fruits, and to watch the changes in them from week to week and season to season is to have an unfailing resource for pleasure throughout life. To teach the child appreciation of our parks and scenery and to make him feel a sense of ownership in them is to make him some day a better man.

These aesthetic values of nature-study are not to be overlooked in a time when utilitarian ideas are as prominent as today. Let the child know that the sky and clouds and sunset coloring and the river and hills beyond are his in the same sense in which the parks are his—to appreciate and enjoy. Whatever one can see that is beautiful is his own as much as though it were his individual property. All that any one can do with a beautiful object is to contemplate it with appreciation and enjoyment. It is possible for the poorest child to be richer than the multi-millionaire.

Of the thousands of poor and ignorant people who visit the New York Botanical Garden during the spring and summer and autumn months, on the one day of leisure in the week, one does not dare to venture a guess at the per cent of those who really care for the things of the park aside from space and coolness. If only these people had been educated to an appreciation of nature what an additional inspiration this place would become in their sordid lives!

President Cleveland went fishing when the affairs of state became too taxing; President Roosevelt hunts bears. When the little boy in the first grade of today becomes president, the same instinctive craving for nature may be satisfied in a simpler way if nature-study be rightly taught. It was not the fish that President Cleveland wanted; he could have bought them with much less trouble at the market. It is not the bear-skins that President Roosevelt wants; he can buy them at the furriers. What both men want is the free pure air, the untrammeled woods, the sound of rippling water, the call of the thrush, ferns, moss, and wild things; in a word, nature. And, after all, fish and bears are only excuses; just the same results could be had by hunting with a camera, or in listing the trees of a region or studying its ecology or in hunting for rare ferns.

Nature-study, then, should educate for the best enjoyment of leisure.

And in defence of this we can do no better and go no farther today than did Aristotle when he said:

"It is clear then that there are branches of education and learning which we must study with a view to the enjoyment of leisure, and these are to be valued for their own sake, whereas those kinds of knowledge which are useful in business are to be deemed necessary, and exist for the sake of other things. It is evident then that there is a sort of education in which parents should train their sons, not as being useful or necessary, but because it is liberal or noble."

In commenting upon this passage in "Aristotle on Education," Burnet says:

"Aristotle's System of Education aims at producing such a character as will issue in acts leading to the happiness of the state; in the second place it aims at preparing the soul for the right enjoyment of leisure which becomes possible when practical needs have been satisfied.

"We must do what is necessary and useful, but still more what is fine.

"Here in simple form is the perennial problem as to whether the end of education is culture, or to fit us for the business of life. The most ardent business men will tell you that they work hard in order that they may be able to retire; the misfortune is that when they have retired they are very often at a loss what to do with their time.

"An education which took as its aim to train people in such a way that they could rightly enjoy the rest which they have earned by a life of toil would, we can see, have a good deal to say for itself, and might be quite as 'practical' as one which merely anticipated the 'useful and necessary' activities of the business life itself. It might sound strange at first, but it would not be amiss if we were once more to speak with Aristotle of the noble enjoyment of leisure as the end of education in its highest sense. It is just the want of such an education that makes men put up with that very poor and cheap substitute for theoria, the life of amusement.

"The Gospel of Work is a noble one and has been nobly preached, but the neglect of the still higher Gospel of Leisure has produced the results which Aristotle has indicated so clearly. We cannot always work, and if our education has not fitted us to use our spare time rightly, we are sure to take to the life of mere amusement. We all know men who would be transformed if only they knew what to do with themselves when they are not at work. We can all see that whole classes of the community are sunk in needless degradation just because their lives are a succession of periods of overwork and intervals of low or vicious relaxation. And we can see too that the end of the nineteenth century, the century of work, has been marked by a morbid,

an abnormal growth of the craving for amusement and excitement which has threatened at times to break up society altogether."

A second value of nature-study is that it developes the power of reason. One learns to generalize from the particular and to make critical comparison. The whole subject of adaptations comes in here and appeals strongly to the child. Bills and beaks and teeth and feet and tails take on new interest when one grasps the fact that they are to serve some special need. Nature-study leads to faith in causality which involves the belief that every phenomenon is linked with preceding factors. The child is freed from superstitions; and bats that cause your hair to fall out, and toads that cause warts, and devil's-darning-needles that sew up your ear if you ever told a lie, lose their terrors and become objects of interest and perhaps companionship.

In addition to the development of the power of reason which should be the second aim of the teacher of nature-study, we may look with assurance for many valuable results which are by-products. In the past one or another of the by-products has too often been mistaken for the main object. This was especially true at first when it was claimed that the greatest gain to be derived from the study of natural objects was the increased power of observation. This increase is a natural result; one looks at the things in which he is interested, and the more things one is interested in, and the more he is interested in some one thing, the more he sees. "It is active seeing, not passive looking, which constitutes observation," says Professor Ganong. The result should culminate in visualization—the power to reproduce subjectively that which has been seen objectively. Instruction can never take the place of observation. The comparative value of the two methods is shown in the following incident which occurred in a school in the State of Missouri:

The nature-teacher said to the third-grade class, "Children, I want you to watch a spider and see if you can learn something about it that you did not know before. Then I would like you to write down whatever you find out and bring it to me." The next day Locke Sawyer brought in the following to his teacher: "Onct I sawn a spider spin his web. He span it on the winder-pain. I watched him as clost as I could. He went along in front and spun behind." Here is the real thing—visualization; one sees the spider 'going along in front and spinning behind.' But the delighted teacher was young and carried away by the enthusiasm of the moment, she

began to tell the children how spiders spin, how they have a little reservoir of adhesive liquid substance within which is forced out and hardens into a thread on exposure to the air. Locke was vastly interested; he wanted to write down what the teacher had said, and at his request his paper was returned. This is what he added: "Inside of himself the spider has two tin cans. These are for its web which is glue before it is spun."

Of the other values of nature-study we may note briefly:

1. Power of expression; the child can talk about the thing he is interested in; he can write about it; he can make a picture of it. But let his teacher remember that these are the products of nature-study, and that nature-study can never be the product of talking of writing or of drawing. The child's language should become more accurate and logical. He should learn to tell the truth and not exaggerate. Laboratory methods should lead to greater skill and dexterity in the use of the hands.

2. Knowledge for its own sake and love of knowledge should result from the widened environment of the child. Knowing his own surroundings, he is able to interpret what he reads, and geography and literature take on a new meaning.

3. The industrial and economic side of the question appeals to many, particularly to parents and school-boards. Plants and animals beneficial and injurious, pests and their extermination, problems of food and clothing, of shelter and sanitation and personal hygiene all become a part of the great subject.

4. Finally, the ethical value of nature-study which results in happiness to the individual is most important. One is never happier than when riding a hobby and riding hard. Birds or butterflies, trees or mosses, ferns or fungi—it doesn't matter so long as one has an absorbing interest in the world without. Health and happiness are not to be despised in these days of nerves and demand for new sensations. To the sympathetic appreciation and love of all created things, nature-study should lead; and if it be true that love is the greatest thing in the world, then is nature-study indeed justified. A man who ranks high in the scientific world showed this spirit when he carried a tub of sea-water back to the beach from which it came, a distance of some rods, and poured the water into the sea saying, "I could not see any life there but it would be a pity to run any risk of destroying life needlessly."

The first value of nature-study then is the aesthetic value. The

first aim should be to widen the environment of the child; to give him the attitude, the idea, the spirit of nature-study; to teach him appreciation of nature as an unfailing resource for pleasure throughout life; to train him for the right enjoyment of leisure. The second value is the scientific value developing reason and recognition of causality in nature, leading to increased power of observation, visualization and accurate expression, and to an appreciation of knowledge for its own sake. The industrial and economic value speaks for itself, while the ethical influence making for happiness cannot be over-estimated.

Nature-study has no need to demand more than rightfully belongs to the subject.

THE AMERICAN NATURE-STUDY SOCIETY

A large number of letters received in the last five days, since the March issue reached readers, makes it clear that the suggestion for organizing an American society meets with very hearty support from the leaders of nature-study. Already there is a long list of prominent names. But some energetic work will be necessary to get the one thousand charter members before September. Will you help? Remember that we need one thousand members for a beginning. Part of these may be associate members, that is, those interested in the nature-study movement but not actively engaged in teaching. Subscriptions paid to THE NATURE-STUDY REVIEW in 1907 will be credited as membership fees for this year, and the editor will render an account to the Treasurer when elected. In order to make a fair arangement for those who are not already subscribers it has been suggested that members enrolling now should pay fifty cents and receive THE REVIEW for the last six issues of 1907, which will contain notices or reports of interest to members. The proposition appears to be financially sound. The undersigned will personally take the responsibility of sending THE REVIEW (six copies) to new members at fifty cents this year, and of paying the expenses connected with the organizing of the Society to December 30, 1907. Please announce this to your friends. Will you join in this movement for the advancement of the nature-study movement? Are you interested sufficiently to lead you to help get together the one thousand charter members? If small circulars such as will go in your letters will help you reach your friends who ought to be members, write to the undersigned stating number of circulars needed. If the Society is to be organized in September so that we can plan for a meeting at the time of the scientific societies in December, and perhaps for meetings in other parts of America at the same time, it will be necessary for every local leader of nature-study to take a personal interest in getting applications for membership.

If you are now a subscriber to THE REVIEW please write whether you wish to be enrolled as a member of THE NATURE-STUDY SOCIETY. Also please suggest names for the Organizing Committee.

Another point: Should there be sections of the Society organized, for example, Pacific, Canadian, Central, Southern, Northwestern, and Eastern? There would be decided advantages in these sections when local meetings, in addition to an annual national meeting, are desirable.

M. A. BIGELOW.

TEACHERS COLLEGE,
COLUMBIA UNIVERSITY

THE CORNELL RURAL SCHOOL HOUSE

In a letter referring to this new building described below Professor Bailey explained its purpose as follows: "I have built this schoolhouse primarily for the purpose of raising the whole question of the rural school and its efficiency. Whatever the merits of this particular building may be, the question is up for discussion. One may go from Maine to Minnesota and see practically the same kind of rural school building, and it is the same type of building as was in use fifty years or more ago. In cities and towns the new ideas are expressed in new school buildings, new churches, new residences, and new kinds of stores and shops. I think it is quite useless to talk about the reorganization of the school curriculum without talking, at the same time, about the reorganization of the building in which the work is to be done."

The New York State College of Agriculture at Cornell University has erected a small rural school-house on its grounds, to serve as a suggestion in school-house architecture and to contain a real rural school as a part of its nature-study department.

The prevailing rural school-house is a building in which pupils sit to study books. It ought to have a room in which pupils do personal work with both hands and mind. The essential feature of this new school-house, therefore, is a work-room. This room occupies one-third of the floor space. Perhaps it would be better if it occupied two-thirds of the floor-space. If the building is large enough, however, the two kinds of work could change places in this school-house.

It has been the purpose to make the main part of the building about the size of the average rural school-house, and then to add the work-room as a wing or projection. Such a room could be added to existing school buildings; or, in districts in which the building is now too large, one part of the room could be partitioned off as a work-room.

It is the purpose, also, to make this building artistic, attractive and home-like to children, sanitary, comfortable, and durable. The cement-plaster exterior is handsomer and warmer than wood, and on expanded metal lath it is durable. The interior of this building is very attractive.

The picture shows the building just as completed, before the grading of the grounds. School-gardens and play-grounds are being made at one side.

The cost has been as follows: Contract price for buildings complete, including heater in cellar, blackboards, and two outhouses with metal drawers, $1800; tinting of walls $25 00; curtains $16 56; furniture and supplies $141 75; total $1,983 31. In rural districts, the construction might be completed at less cost. The average valuation of rural school buildings and sites in New York State in 1905 was $1,833.63.

The building is designed for twenty-five pupils in the main room. The folding doors and windows in the partition enable one teacher to manage both rooms. The openings between school-room and work-room are fitted with glazed swing sash and folding doors, so that the rooms may be used either singly or together, as desired. The work-room has a bay window facing south and fitted with shelves for plants. Slate black-boards of standard school heights fill the spaces about the rooms between doors and windows. The building is heated by hot air; vent flues of adequate sizes are also provided so that the rooms are thoroughly heated and ventilated.

On the front of the building and adding materially to its picturesque appearance, is a roomy veranda with simple square posts, from which entrance is made directly into the combined vestibule and coat-room and from this again by two doors into the school-room.

Inquiries about the construction details of this school building may be addressed to L. H. Bailey, Director College of Agriculture, Ithaca, N. Y.

RURAL SCHOOL BUILDING
CORNELL UNIVERSITY.
ITHACA, NEW YORK
GIBBS, WALTZ, ARCHITECTS, ITHACA, N.Y.

FIRST FLOOR PLAN

THE ATTENTION GIVEN TO SCHOOL GEOGRAPHY

[EDITORIAL NOTE.—The relation of nature-study and geography, which is growing more and more intimate as nature-study develops along practical and industrial lines *in addition to* the sensible side of its original aesthetical tendency, makes it certain that many readers of THE REVIEW will agree with the following which appeared recently as an editorial in the *Journal of Geography*. We reprint it with the hope that some nature-study workers may be led to help the geography in their schools. The improved geography will react helpfully on the nature-study.]

"This Journal has from time to time voiced its conviction that insufficient attention is given to school geography in many of the school systems of the country. This is indicated in several ways. A large number of the workers in the school field still believe that geography is a cram subject and, as such, deserves no more time than is necessary for memorizing the facts marshalled in a more or less skeletal way in the school geographies. It is also evidenced by the constantly decreasing time allotment in school curricula and by the stuffed courses of study printed for many cities in which the amount of ground to be "covered" in a week or month is simply colossal.

Even more the tendency of the country to believe that geography needs but little attention is indicated by the scant amount of space devoted to the subject in educational periodicals. With the exception of a few extremely progressive papers, geography receives but little attention in the periodicals most used by teachers. An occasional brief note may be included, while other subjects like English, history, art, nature-study or manual training have several pages regularly devoted to them. This is not as it should be, for geography is one of the four time-honored and proven fundamental subjects in the education of any man or women. As such it deserves an adequate amount of attention by publishers, editors, superintendents and supervisors. If these several classes of leaders would indicate their belief in geography by devoting attention to its educational aspects geography teaching in schools would improve as in no other way. If no incentive is given to the average teacher to pay more than passing attention to geography, the subject will get but little more time or effort than the minimum prescribed by the course of study. This Journal believes that the great problem in geography teaching is elementary school geography. The larger number of the pupils in the country study geography in the elementary school or not at all. The material here is most difficult to handle, is less well ordered and more involved. It is in this field that teachers need the most help. The problem is large enough and sufficiently important to be worthy of all the attention it can receive. Let us hope that a new era may soon dawn and that geography teaching may receive the attention from all workers due to so important a subject."

INTERNATIONAL CHILDREN'S SCHOOL FARM LEAGUE

The friends of the Children's School Farm movement in New York City have formed an International Children's School Farm League. "INTERNATIONAL" because of several important developments in foreign countries as well as in all sections of this country. The Children's School Farm in New York City, founded by Mrs. Henry Parsons, and now conducted under her directorship by Municipal authority, has been so successful, that urgent requests for advice and information in regard to the work have been received in such numbers that Mrs. Parsons cannot adequately respond to them.

It is the purpose of this organization to furnish practical information; also opportunity for mutual help and to carry on the work in directions precluded by the restrictions surrounding City Departments.

The proposed plan is to issue concise information as to how to start and conduct similar work; to whom to apply in each section for proper advice and influence; to establish an exchange of photographs and lantern slides, and to provide for the services of a lecturer and practical adviser.

Under the auspices of such an organization, Children's Gardens can be placed on unimproved property and introduced in connection with institutions for children and convalescents. The boys and men in the Tuberculosis Hospitals frequently say: "Oh! if we had something to fill in the long hours." Wherever this work has been introduced in prisons it has proved most advantageous. Appeals have recently come for the starting of Gardens for feeble-minded children. The International Committee of the Educational Department of the Young Men's Christian Association have asked for literature and photographs that they may, through their various Secretaries, interest boys to do similar work in their leisure hours.

The opportunities for co-operation are innumerable. Florists and private individuals with country places have offered seeds and land. The Agricultural Department at Washington and several Experiment Stations of different States have already promised their aid.

The membership will consist of Active, Honorary, Advisory and Sustaining Members. All those who desire to have a part in this work are invited to become either Active or Sustaining Members. Active Membership dues, $1.00; Sustaining Membership dues, $25.00. Additional donations are desired.

The officers are: Mrs. Henry Parsons, President, Miss Emily Lamb Tuckerman, First Vice-President, Mrs. Howard van Sinderen, Second Vice-President and Treasurer, Miss Emily B. VanAmringe, Secretary.

There is a Board of Directors, several Honorary Vice-Presidents, and an Advisory Board.

For fuller information address the League at 29 W. 56th St., New York.

THE AGASSIZ ASSOCIATION

At a recent meeting of the trustees of the association, held in Pittsfield, Mass., Dr. Edward F. Bigelow, of Stamford, Conn., was unanimously elected to the office of president. The Agassiz Association was established in 1875, in Lenox, Mass., the president of the first society being Harlan H. Ballard, whom Dr. Bigelow succeeds as president of the national body. Louis Agassiz, whose name it adopted, had recently died when the little society, which was the pioneer of a large movement, came into being, and his widow and his son gave their hearty approval to the new undertaking. Something of the sort had before existed in Switzerland, the native country of the scientist, but the American association reached proportions of which its originators never dreamed. The association was incorporated in 1892, under the laws of Massachusetts, and its headquarters have been in Pittsfield. The objects stated in the act of incorporation are the promotion of scientific education, the advancement of science, the collection in museums of natural and scientific specimens, the employment of observers and teachers in different departments of science, and the general diffusion of knowledge. It has chapters all over the United States, and several in foreign countries. The chapters contain from 4 to 120 members each, and there is said to be a total membership of 10,000 or 15,000. The age of its members varies from 4 to 84 years, but of course there are very few at the extreme points. The bulk of the members consists of boys and girls, with a liking for healthy, clean, outdoor life, and a desire to study plants and animals. In the organization of the association, there are twenty corporators, most of whom live in Massachusetts, Rhode Island, Connecticut and New Jersey. All are prominent men in their respective localities. Seven trustees are chosen by the corporators.

The association had an exhibit at the St. Louis exposition that attracted considerable attention, and it was awarded a diploma.

The officers serve without salary, and they have always shown enthusiasm for the work in which it has been engaged, the encouragement of nature-study. This has been directed largely through correspondence, and, as a matter of fact, it can be fairly claimed that the Agassiz was the prototype of all correspondence schools. The income to meet current expenses comes from voluntary contributions, small fees from chapters, when entering, and as annual dues. There is no charge for the instruction given, and this invol-

ves the answering of many thousands of questions upon almost every conceivable subject. The association has a small endowment fund.

The Agassiz Association is not especially endeavoring to make new discoveries in the scientific field, but to bring before young people facts well known to experts. And yet members of the association do often add to the sum of human knowledge. It is surprising how little the average person knows about the flowers, the trees, the birds and the animals in our gardens and fields. It is impossible to explain the value of this knowledge. One has to discover that for himself, and the association's aim is to encourage the discovery.

A distinguished Russian, Kropotkin, in an article in the *Nineteenth Century Magazine*, mentions the Agassiz Association as a splendid idea for the exchange of correspondence and specimens, and for education through interchange of ideas with young people all over the world. This plan, carried out from the first, will we hope, be developed to a greater extent than ever before, and it will be expanded.

Circulars giving full information may be obtained from the new President. The movement deserves increased support.

BOOK REVIEWS

Agriculture Through the Laboratory and School-Garden. By C. R. Jackson, Teacher of Agriculture and Botany and Mrs. L. S. Daugherty, Assistant in Physical Geography and Zoology, instructors in the State Normal School at Kirksville, Mo., is published by the Orange Judd Company of New York. Price is $1.50. This is a thoroughly valuable book for one engaged in teaching elementary agriculture or in directing the work of the school-garden. It is also an excellent book to put into the hands of any farmer who wishes to keep in touch with the latest and best in his line of work. It is written in good clear English and the organization of its contents is of such a nature that it will be of most value to the student. It contains a rich fund of materials and suggestions of a very practical character. It is a timely book. The print (407 pages) and the illustrations (150) are both most excellent.

State Normal School, De Kalb, Ill. L. A. Hatch.

School Gardening for Little Children. By Lucy R. Latter. London: Swan Sonnenschein & Co. 1906. 166pp., illustrated. Introduction by Professor Patrick Geddes. Dedication: "To the little children who show the way."

Our authoress has taken charge of a primary school in one of the thickly settled districts of London, induced the School Board to tear out a newly laid asphaltum play-ground and cart in loam in its place. (Please read this sentence over and realize what it means). We will allow Miss Latter to tell the result of her experiment in the words of her preface.

"I have tried, with the aid of a sympathetic staff, to prove that it is possible to make nature-teaching the central point of the life of a school without detriment to the children; that such teaching gives a real meaning and incentive to all the handwork, and leads to a richer and truer appreciation of poetry, pictures, and music. The experiment has been going on for nearly six years, during which time it has successfully stood the test of Government inspection. Each year has shown an increasing gain to the children intellecually as well as physically and morally. Instead of the children being less prepared for the work of the senior schools, it is found that they read, write, and do arithmetic as well, if not much better, for having had daily contact with plants and animals, and opportunities for observing the various natural phenomena which affect their lives in one way or another. It is further found that such children pass on to the senior schools with a quickened power of

observation of far greater intelligence, a keener desire to learn, and a greater refinement of heart, than if their earlier years had been spent in acquiring mechanical perfection in the arts of reading, writing and arithmetic before any real experience has been accumulated as a basis for those more formal branches of instruction.

"Teachers who have had longer experience in actual school work need surely have no anxiety, therefore, in giving full play to nature-teaching in their schools. The way should be easier, and the results richer and greater. The suggestions from the Board of Education offer facilities hitherto unknown to elementary teachers. Let us not rest, therefore, until every kindergarten and school becomes, indeed as well as in name, a place where our children may have opportunities for enjoying as fully as possible communion with some of the beautiful things of Nature, and where we, as educators and teachers, may come to find a new and deeper interest in life, since in wandering forth with our children into the realms of Nature we may be helping to hasten a new order of things which shall conduce to the welfare of humanity as a whole."

We learn directly from Miss Latter that Germany is her "second home," and this explains in a measure how she has been able to bring so large a contribution to English, and, we may hope, to American education. It should also be stated that Miss Latter has come to the work after about fifteen years of experience as Assistant Superintendent of Methods in Infant Schools of London; of which a testimonial says: "Quietly and steadily, but none the less effectively, you have successfully established Fröbelian principles in our schools, and indirectly into Voluntary Schools also."

While the book abounds with artistic touches of great delicacy and beauty, it never fails in accurate detail which make it at every step helpful to the practical teacher, and the theory in the reasons for each phase of the work is clearly and convincingly stated. The picture on the title page gives us the key-note of the whole book. It shows a little girl watering a bed of flowers, looking down into their faces as she pours, and is entitled: "Like a mirror one giveth back to the other." This instant reaction of the lesson upon the life and character of the child stands out everywhere as central and dominant. Nowhere have I seen this thought more skilfully expressed than in this book. Miss Latter has wrought under difficulties and against odds that to most would have seemed ample excuse for not attempting anything; and, as usual, success has been accorded in proportion to the intelligence and sincerity of the effort. We need have no fear for garden work anywhere in this country, since it can prove itself so valuable in London.

Professor Geddes writes a perfect introduction. The school official is

first depicted self-satisfied in the consciousness that he had duly "encouraged" every "practical" study—"save, perhaps, that of childhood itself"—"of course, outside of mere sentimental interest, mere evolutionary dreams—say of "lilies how they grow."

Then after ten or twelve pages of such suggestive banter, he finally concludes:

"As amid our politics, religious controversies, and education enactments, realities of education again disclose themselves; we again see now and then a little child in the midst; and the hope is not perhaps wholly utopian, that even those respectively inheriting the watchwords of "science" and "religion" may be able to unite in such an exegesis as that a certain passage of the child's reading not only says "consider"—"the lilies"—"how they"—"grow,"—but means that.

"Meantime, however, may we not allow our own schoolmistress and her children to proceed to the reclamation of the administrative desert of our particular school-yard? Each oasis, once begun, may grow; some day they may even meet."

Another fundamental thought is that garden work does so much for the child because it has in the past done so much for the race. It has been basal to the evolution of civilized life. This crops out in the closing words of the preface and finally appears in the last words of the book: "Life calls—and responds—to life; and with prophetic insight the pioneers of gardening in its highest and best sense see in this pure and healthy occupation the beginning of a newer and better order of things for all mankind—

"The freedom and divinity of man,
The glorious claims of human brotherhood."

We are not surprised to learn that the book is already being translated into Danish and Italian.

C. F. HODGE.

The Log of the Sun. A Chronicle of Nature's Year. By C. W. Beebe. New York: Holt. 1906, pp. 345, 52 full page plates. $6.00.

This new book by the Curator of Ornithology in the New York Zoölogical Park and author of the excellent book on birds which was reviewed in this magazine in January, consists of fifty-two short essays on "familiar subjects from unusual points of view." "Emphasis has been laid upon the weak points in our knowledge of things about us, and the principal desire of the author is to inspire enthusiasm in those whose eyes are just opening to the wild beauties of God's out-of-doors."

Many of the essays are intensely interesting. As might be expected from the

author's earlier books, birds are prominent in this chronicle of a year. The superb illustrations, most of them by Walter King Stone, certainly help inspire enthusiasm in the reader.

The wide range of topics which would naturally enter into such a book make it impossible to describe adequately its contents in a brief review. One who will sit down to recall the natural objects which he has seen in a year will get some idea of the topics which the author had available for use in this book. An index makes reference possible.

The book will appeal chiefly to those who buy nature books for their literary and artistic charm. It is not indispensable to those who must occasionally buy books as guides to studies of nature.

First Book of Birds and **True Bird Stories.** By Olive Thorne Miller. Boston: Houghton, Mifflin. New school editions, 60 cts. each.

It is proper that these well-known books intended for children should be issued in school editions. The author's point of view is true to nature-study ideals, for she says: "It has seemed to me that what is needed at first is not the science of ornithology,—however diluted,—but some account of the life and habits, to arouse sympathy and interest in the living bird, neither as a target nor as a producer of eggs, but as a fellow-creature whose acquaintance it would be pleasant to make." With this purpose in mind the author has written these introductions to bird study.

NATURE-STUDY AND SCIENCE NOTES

Fur Seals. The destruction of the Pribilof Islands fur seals by pelagic sealing still continues. The herd which, according to the surveys made in 1874 by direction of the Congress, numbered 4,700,000, and which, according to the survey of both American and Canadian Commissioners in 1891, amounting to 1,000,000, has now been reduced to about 180,000. This result has been brought about by Canadian and some other sealing vessels killing the female seals while in the water during their annual pilgrimage to and from the South, or in search of food. As a rule the female seal when killed is pregnant, and also has an unweaned pup on land, so that for each skin taken by pelagic sealing, as a rule, three lives are destroyed—the mother, the unborn offspring, and the nursing pup, which is left to starve to death. No damage whatever is done to the herd by the carefully regulated killing on land; the custom of pelagic sealing in solely responsible for all the present evil, and is alike indefensible from the economic standpoint and from the standpoint of humanity.

In 1896 over 16,000 young seals were found dead from starvation on the Pribilof Islands. In 1897 it was estimated that since pelagic sealing began upward of 400,000 adult female seals had been killed at sea and over 300,000 young seals had died of starvation as the result. The revolting barbarity of such a practise, as well as the wasteful destruction which it involves, needs no demonstration and is its own condemnation. [From President Roosevelt's Message, 1906.]

Species of Aster. Two species of Aster named in Gray's "Manual of Botany" have a large number of forms with slight variations. Dr. Burgess, of New York, separates the two species into eighty-one new species. Commenting on this species-making, *The American Botanist* says: It is safe to say that none but the author could identify these eighty-one species if the labels should accidently get mixed, but the author, undaunted by this array of species, has named ten more varieties and nearly two hundred and fifty lesser forms! Two species expanded into nearly three hundred and fifty forms. This ought to amuse even the hawthorn specialists. If anybody ever starts in on the human race with similar ideas of what species are, some families will doubtless be found to consist of at least half a dozen new species and possibly one or two new genera."

Unstable Names of Plants. Referring to an attempt to make another change of scientific name for a well known plant *The American Botanist*, makes the truthful statement that the movement for stable nomenclature has made scientific plant names so unstable that common names are used by preference when one wishes to be exact. Three-fourths of the names of orchid in Gray's "Manual" have been changed by the systematists.

Birds and Burdock. *Bird-Lore* publishes a note and a photograph showing a bird entangled in the burs of burdock on which it had alighted. Similar cases have been reported.

Aigrettes. The good news is reported (by *Bird-Lore*) from London that there is a decided falling off in the sales of heron plumes (aigrettes) "on account of the absence of American trade." For this thanks are due to the Audubon Societies behind the laws. At a recent meeting the Federation of Women's Clubs of Pennsylvania and New Jersey adopted a resolution against the use of aigrettes by club women. Each month there is news of a decided advance in the work of bird protection. It is to be hoped that every nature-study teacher is helping in the great movement toward making the coming generation of women realize their full responsibility for the utterly barbarous practices connected with securing bird's skins for ornamental purposes.

Fungi Which Discolor Wood. Many of the blue, brown, black, pink, purple and yellow stains which appear on pine and other lumber in piles are caused by fungi. The "1906 Report of the Missouri Botanical Garden" contains an extensive paper by Dr. Hedgcock, who has recently investigated the subject. Certain colors are due to the insoluble colors of the filaments (mycelium) of the fungi which penetrate the wood but do not actually stain the wood cells. In other cases soluble pigments are taken up by the cell-walls of the wood. Or both causes may be combined.

Bag-Worm Killing Branches. In the above mentioned report Dr. H. von Schrenk describes the killing of arbor-vitae and other twigs by the constructing bands which suspend the bag-worm cocoons. Growth pressure causes swelling followed by girdling similar to that produced by a tightly wound wire. Commonly most of the cocoons drop from twigs about the end of June because the growing twigs break the encircling bands which suspend the cocoons.

Seedless Oranges. According to an article in *The World Today* the seedless or naval oranges came from Brazil. Four shoots were sent to California in 1872. Two lived and in 1877 produced 16 oranges. The new orange tree could be propagated only by budding, and the first buds sold at $1 each, and later at $5 a dozen. One box of naval oranges was grown in 1880; since then the annual product has risen to ten million boxes, and the two trees have multiplied to over four million. The original parent tree last year bore two bushels of choice fruit. In Southern California alone $100,000,000 is invested in citrus fruit culture, chiefly of oranges, and in related industries.

Economic Role of Lichens. These plants are the first to attack rocks and they greatly aid in reducing rocks to soil. Lichens, such as the "reindeer moss," are food for both man and animals in high northern regions where other plant food is not available. Another species in northern Africa is blown long distances by the wind and falling in the deserts where food is scare is eaten by man and animals. It is supposed to have been the manna of the children of Israel. Other species are important for both man and animals in Finland, Greenland, Iceland, Norway and Sweden. The nutritive qualities are due to a peculiar starch-like compound. Many species were formerly considered medicinal. Many dyes, chiefly reds, purples and blues, are used for home coloring of cloth, wood, etc. Litmus used for testing acids and alkalies in chemical experiments is obtained from lichens, chiefly in Holland. Orseille is another name for this dye. It is supposed to be the "blue and purple" of the old Testament. [*Plant World*, Nov. 1906.]

Meadow Mice. A recent pamphlet from the U. S. Dept. of Agriculture points out their destructiveness to grass, fruit, vegetables, hay in stack, and orchard trees. There is danger that the continued destruction of hawks, owls, snakes, and small carnivora may allow the mice to multiply until extensive ravages result.

Workingmen's Gardens. The *Century Magazine* for March contains an interesting account of the development of the so-called workingmen's gardens in France. The author is W. H. Tolman. The movement for such gardens was instituted by certain philanthropists in 1889, the object being to improve the people morally and physically as well as to benefit them financially. The present status of the work is well indicated by the fact that last year there was held in Paris a "Congress of Workingmen's Gardens" attended by 700 delegates. In brief the plan followed is for certain individuals or organizations to acquire suitable vacant property in various cities and by aggressive work arouse the workingman's interest so that he will rent a patch which he may cultivate with such advice and assistance as is necessary to enable him to produce successfully. The average rental charged is $2.50 for a plot containing 478 square yards. In many cities prizes are given for successful results. The competition aroused is often quite keen, and the spread of the idea thus greatly accelerated.

C. A. M.

Snake Myths. The following from Surface's "Serpents of Pennsylvania," (Published by the State Department of Zoology, Harrisburg) refer to popular beliefs which are entirely erroneous: Snakes do not sting with their tongues. Snakes do not charm birds and people. The green serpents are not venomous. There is no such a creature as a hoop snake, which rolls like a hoop. There is no horn snake, with a venomous horn at the end of its tail. Snakes are not blind once per month, and regularly during "dog days." Snakes do not molt or shed their skin each month. Serpents can not blow out or spit poison. Snakes do not chase and attack people without provocation. Serpents and other reptiles are not slimy. Certain kinds of snakes do not milk or suck cows. When snakes are killed the tails may die before the sun goes down or before it thunders. Kill a snake and turn it over will not bring rain. Snakes do not spring or jump from the ground at their victims. Snakes do not lose their venom by being deprived of water for six days or more. Snakes do not have medicinal properties.

Field Studies in Botany. No. 4 of this series issued by the Department of Botany of the University of Michigan is "Bog Studies;" No. 5 on "Field Work in Towns and Cities."

RECENT (1905–1906) BOOKS IN NATURE-STUDY AND SCIENCE

Log of the Sun. By C. W. BEEBE. A chronicle of nature's year. 52 full page plates, numerous text figures. New York: **Holt & Co.** 1906. $6.00.

Darwinism and the Problems of Life. By CONRAD GUENTHER, translated by JOSEPH MCCABE from third German edition. A study of familiar animals from evolution viewpoint. Pp. 436. New York: **Dutton & Co.** 1906. $3.50.

Real Things in Nature. By E. S. HOLDEN. A reading book of science. Pp. 443, 408 figs. New York: **Macmillan Co.** 1902, reprint 1906. 65 cents, school edition, 50 cents.

Familiar Wild Animals. By S. A. LOTTRIDGE. A reader for children. Pp. 115, photographs. New York: **Holt & Co.** 1906. 60 cents.

Bird World. By STICKNEY and RALPH HOFFMAN. A reader for children. Boston: **Ginn & Co.** 1906. 60 cents.

How Ferns Grow. By MARGARET SLOSSON. A study of the development of form and variation of fern leaves. Pp. 156, 46 plates. New York: **Holt & Co.** 1906. $3.00

Good Health. By FRANCES GULICK JEWETT. The first of a series of five books on hygiene for elementary schools. Pp. 172, illustrated. Boston: **Ginn & Co.** 1906. 60 cents.

Renewal of Life. By MARGARET W. MORLEY. How and when to tell the story to the young. Pp. 200, illustrated. Chicago: **McClurg & Co.** 1906. $1.25.

Agriculture Through Laboratory and School-Garden. By C. R. JACKSON and Mrs. L. S. DAUGHERTY. A text-book of elementary agriculture. Pp. 403, 150 figs. New York: **Orange Judd Co.** 1905. $1.50.

Biology of the Frog. By S. J. HOLMES. A text book for colleges. Pp. 370, 94 figs. New York: **Macmillan Co.** 1905. $1.60.

How to Know Wild Fruits. By MAUDE S. PETERSON. A guide to trees and shrubs. Pp. 340, illustrated. New York: **Macmillan Co.** 1905. $1.50.

Practical Physiography. By H. W. FAIRBANKS. A text-book for the high school. Pp. 542, 403 figs. Boston: **Allyn & Bacon.** 1906. $1.60.

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VOL. 3 MAY, 1907 NO. 5

THE ORGANIC FIELD OF NATURE-STUDY

BY GEO. H. HUDSON

State Normal School, Plattsburg, N. Y.

In preparing a syllabus for a course of lectures on zoology, published by the Extension Department of the University of the State of New York in February 1893, I felt that one legitimate purpose of such a course might be the gaining of a popular appreciation of what man had already obtained as a reward for his time spent in the study of animal life. This field was briefly outlined under the heading "Scope and power of the appeal of nature to man." Finding the scheme useful in teaching, it was soon amplified and made to include the plant as well as the animal kingdom. A form very like the first part of that accompanying this article was distributed among the members of the Nature-Study Section of the State Teachers' Association during its meeting at Cliff Haven in the summer of 1903, and used as the basis of my talk to the teachers of that session. In *Nature* for January 28, 1904, p. 290, there appeared an interesting grouping, by Professor E. Ray Lancaster, from which I immediately borrowed material to make my scheme more complete. The scavengers of his group C and his groups E, F and G, were new to my table. Group G and the scavengers were placed as the second and first divisions of my section C; Group F became the new section G; group E was not used but might have formed a special sub-division of my section bearing the same letter.

One who will examine the first two pages of the accompanying tabular form and will make a brief historical retrospect of each division, will find that man's study of nature has contributed to our present position of comparative comfort and safety in a degree rarely appreciated.

The Field of Man's Relation to Organic Nature.

PART I. The older relations or those we may designate as physical or practical

- Helpful
  - Usually through yielding life
    - *A.* Food givers
      - Direct
        - Animal: Mammals—Deer, cow, sheep; Birds—Duck, hen turkey; Fishes—Trout, herring, cod; Molluscs—Oyster, clam.
        - Vegetal: Roots—Turnip, beet; Stems—Asparagus, potato; Leaves—Cabbage, spinach, celery; Fruits—Pear, squash; Seeds—Beans, peas.
      - Indirect: Flower fertilizing insects; Grasses and grains for feeding stock; Marine and fresh-water microscopic life; Nitrifying bacteria.
    - *B.* Material for manufacture: Shelter—Roof and door—Skins, poles, woods; Clothing and draperies—Furs, wool, silk, linen, cotton. Fire and light—Wood, animal and vegetal fats and oils. Ornament—Feathers, shells, pearls, animal and vegetal dyes, varnish. Weapons and tools—Bone, spear, harpoon, sickle, needle, club, sling. Transportation—Snowshoes, skees, sled, wagon, ship. Records—Skins, bone, bark, paper, canvass.
  - While living
    - *C.* Helpers in wild state: Sanitary—Hyæna, vulture, flies, carrion beetles. Destroying enemies—Skunk, toad, snake, "lady-bug," hymenoptera.
    - *D.* Domesticated as companion or servant: Indicating presence of enemy or game—Squirrel, crow, blue-jay. Defending person and property—Dog. Hunters for man—Otter, dog, falcon. Sources of physical power—Ox, horse, camel, elephant.
- Antagonistic
  - *E.* Bringing death, injury disease: Directly—Tigers, snakes, parasitic worms, Aminita, bacteria. Indirectly—Flies, mosquitos.
  - *F.* Reducing food-supply: Wild supply—Wolves, rabbit, hawk, grain eating birds. In cultivation—rust, smut, mildew. Stored—Rats, mice, grain moths and beetles, bacteria.
  - *G.* Destroyers of unworked or worked material: Buildings, clothing, ships, books, paintings—White ants, wood beetles, clothes moths, ship worms, moulds.

PART II.
Newer relations, or those we may designate as psychical

- Body of knowledge
  - *H.* Of animal and plant forms, habit and habitat - - - — Natural history, taxonomy, morphology, ecology.
  - *I.* Of structure of body, — Anatomy, comparative anatomy, histology, cytology.
  - *J.* Of function, — Physiology, comp. physiology, psychology, com. psychology.
  - *K.* Of reproduction and development, — Embryology, heredity.
  - *L.* Of care of body, — Hygiene, medicine, surgery.
  - *M.* Past history of body, — Paleontology.
  - *N.* Organic law, philosophy, — Biogenesis, acceleration, modern concept of evolution.
- Education
  - General
    - *O.* Adjustment to environment, — Suggestion and imitation, How to avoid enemy, capture prey, birds nest basket, clay pot.
  - Special
    - *P.* Physical development. — Respiratory, digestive, locomotive mechanisms; manual training
    - *Q.* Development of sense perception, — Form, color, sound, taste.
    - *R.* Development of intellect, — Power of observation, memory, discrimination, apperception, constructive imagination, inductive and deductive reasoning
    - *S.* Development of will, — Voluntary, attention through interest.
    - *T.* Development of feelings, — Love, pity, tenderness, gentleness, sacrifice, contentment—Trained through care of animal and plant companions and their young.
    - *U.* Aesthetical development, — Influence of birds, bird songs, flowers, etc.
    - *V.* Development of religious ideas, — Note part played by animal and plant in early religious development of all peoples.

Compare the plant and animal foods of primitive people, or of our own early history, with the variety and the abundance of today. How large a part of the world now contributes to the table of a working man compared with that which furnished his table in King Arthur's time. Looking forward we desire and we anticipate a very marked improvement in the food-supply of nations. Those men who through the study of nature discover or make new foods, who increase the yield or quality of others, or who discover better methods of food preservation, are public benefactors of no mean order. Ought not every child to recapitulate in part, through his own personal effort, the main steps taken by the race in the development of its food industries? Such a recapitulation is needed in order to make of the child a man of broader sympathies and clearer foresight. The child may become in time a member of a legislative body, or he may use his mental powers as a moulder of public opinion. In either case he will render his country better and more intelligent service if he has come to recognize the value and dignity of that labor which directly furnishes a nation's food-supply and which is, in the most fundamental manner, one of its surest and greatest sources of wealth.

Group B will bear similar study. Compare the comforts of the primitive cave or hut with those offered by a single room today. Try to enumerate the plants that have given woods for the roof, walls, floor and furniture; fibers for woven fabrics and papers, gums and oils for paints and varnishes; and dye stuffs to contribute to the color scheme. The animal kingdom has given of its furs, hair, leather, ivory, feathers, silk, lacquer, and red and purple. The book in your hand, in the pigment and oils of its letters, the fibre in its paper, thread and silk, the paste and glue used in its binding and the morocco of its covers is an expression of nature's bounty and man's conquest.

The geographical extent of the biosphere involved and the millions of human hearts and hands connected with the collecting, curing, shaping and assembling of the material is really beyond comprehension. It opens to the mind an immense vista of human industry and commerce. Was not our Whitman intoxicated with this view in his "Salut au Monde?" How many of us living in the colder lands of the north (sheltered from the storm, lighted and warmed, fed and made comfortable

by nature's gifts) ever think for a moment of the cost in human effort:—beginning back in primitive times in the trying life of the savage, passing through the dangers of explorations in foreign lands, and finally coming down to our own times with its great army of trained workers endeavoring to wrest yet more of nature's secrets from her, and with them to minister in still greater degree to our well being and comfort. Not alone do the materials themselves speak of nature's bounty and man's effort, but the designs used in decoration and perhaps the thought of the book are made to mirror some of nature's finer moods and so meet still higher needs. May we not find a number of good reasons for wishing our children to have a training that shall give them a larger measure of appreciation of this great field than that which has formed the habit of our thought? Will being blind to our abundant blessings, or possessing the power to see them, lead to the happier and more contented life?

In training for good citizenship we cannot afford to neglect subjects which stand in so close a relation to life or death as do those listed under section E. The older knowledge concerning the danger of loose tigers is very generally understood by the public at large, but the greater danger from flies and bacteria is so little appreciated as to be more usually the subject of jest than that of serious thought. Nature-study may well lay a foundation in this field that shall yield results of tremendous moment to mankind.

This tabular form should speak to us of the value of real nature-study in no uncertain tones. The race in its early childhood passed through a compulsory course in which the successful pupils were rewarded with prizes of food, clothing, and mates; while the delinquents were granted an early and permanent cessation from the struggle for existence. To eat and to avoid being eaten were two great ever present and ever pressing questions of the day; and man was compelled to investigate nature in the most direct and persistent manner for her answers. Crude as were the early ideas gained, as shown by early methods and beliefs, from this direct study has come a wealth of knowledge so great that no one life can compass it, and few of us even realize its extent and variety.

Sections H to N, Part II of the tabular form, outline a portion of this field of knowledge. If one would realize its vast worth,

let him think how much of this field his physician ought to know and then trace its value in relation to food and textile industries. It would be well for the world if the rising generation could come to know in a practical and intimate manner just how this knowledge was obtained by man. It did not come through any artificial system of education but by a method very foreign to all such systems, and that was through the direct study of nature herself.

The method by which man has lifted himself so far above the rest of the brute kingdom and through which he has received such practical and valuable returns is a method that we should train our children to use, and it is most assuredly the true method for nature-study. It has as yet but a very small place in our schools; and one of the strongest reasons we have for the introduction of nature-study is to supply that training which only this direct method can give. Its contributions to civilization should convince the most skeptical as to its great worth.

The need of this contact or laboratory method has been the more markedly felt on account of the influence of city life and the increased term of the child's imprisonment between uninviting school walls. Many have noted with grave apprehension that these influences have both served to markedly lessen if not in greater part to do away with the nature-schooling which in former generations played so prominent a part in early child life. If the law of biogenesis demands a recapitulation of race history as a foundation for all higher development, should we not view with some concern so marked a suppression of free contact with nature in the child life of today? This great biological law not only gives us important reasons for the introduction of nature-study into the too cold atmosphere of ordinary school life, but serves as a guide in the order of presentation of our material. The children of the lower grades should be led to picture to themselves the life of the hunter and the reasons why he must often go hungry. The story of the famine in Longfellow's "Hiawatha" illustrates this phase. How superior to this is the picture of nomadic life. Next comes the tillage of the soil with the more permanent and better home, and last the story of the improvement and preservation of our foods and the work of the agricultural experiment stations.

There is another organic law which should be one of great

value in education and yet it seems to be little known by teachers. It is the "law of acceleration" of Cope and Hyatt. This law will caution us against the common error of making the earlier portions of our course too full of ancient detail. Too persistent stimuli of the ancient type may be made to minister to characteristics which are now on their normal way to extinction. The newer parts of the field should receive the greater care. This adjustment of the materials to the needs of the developing mind is a question of some difficulty, but it is one that should receive its proper attention.

The aim of nature-study may well be made more definite. It is not to train the child to raise cabbages and cucumbers,—yet the raising or caring for something growing in the soil is very essential to his obtaining a vivid basal idea concerning agriculture, and this knowledge is essential to good citizenship. He must be led to realize his dependence on mother earth and to learn how his race reaped the various blessings he now receives at her hands. He may never become an investigator or searcher for additional benefits, but as a citizen he will respect and will foster research. Citizens of this stamp are needed. A comparison of the national attitudes of Russia and Japan toward biological and physical research and its results are well worth some earnest thought. In other words the training outlined gives him a knowledge and a finer appreciation of a very vital department of the history of civilization, with books in the hands of his teachers but with real things in his own hands. He is learning in the most fundamental manner by doing.

Sections O to V are an attempt to indicate some directions in which this study of the environment has reacted on man and been an important factor in his mental development. Ought not our course to be so planned as to secure in a definite manner some of the effects of this reaction and is not here to be found one of the most valuable things which our course might give, the development of intellectual and ethical power?

Hawthorne, in "Mosses from an Old Manse," has written:—"Childless men, if they would know something of the bliss of paternity, should plant a seed—be it squash, bean, Indian corn or perhaps a mere flower or worthless weed—should plant it with their own hands, and nurse it from infancy to maturity altogether by their own care." Hodge, in "Nature-Study and

Life," says that "To allow a child to grow up without planting a seed or rearing a plant is a crime against civilized society." These quotations show a deep appreciation of the value of *contact* with nature to develop that factor in character which we have classed under section T. The ethical effect of such work is gradually coming to be realized. Must we not see also that the rearing of young animals, particularly birds and mammals, is a still more potent influence. The child that has never seen a cat nurse and care for a litter of kittens has lost something of incalculable value. One of the most potent factors in placing the ethical feelings of the civilized races so far above the plane of the hunting savage was the development of altruism through the care given to flocks and herds. Do we make too much of this influence? How high an ethical ideal do you find expressed in the words,"He shall feed his flock like a shepherd; he shall gather the lambs with his arm, and carry them in his bosom, and he shall gently lead those that are with young?" How rich a tribute to the character of Jesus in his title of "Divine Shepherd?"

It should not be necessary to further point out the relation of nature-study to the lettered sections of the tables. The student of comparative religions, particularly if he gives his attention to older forms, will find enough to convince him that the part played by animal and plant in the development of these forms was a very important one. If we question as to the value we might obtain from nature-study in the development of the will, let us examine the effect it might be made to give on so fundamental a condition of intellectual operations as voluntary attention. Here we may have that interest which is so powerful a holder and trainer of attention and Professor James is authority for the very sweeping statement that attention so held "*makes* experience more than it is made by it." Of the millions of items present to the senses he also says, "Only those items which I *notice* shape my mind." There is food here for reflection.

Is it not time to disabuse our minds of the idea that anyone can teach nature-study? Ought we not to insist at least on breadth of mind, some knowledge of the field in its various branches, and a sympathetic love of both nature and the child? And again is it not also unwise for us to assert that the love of nature is the only thing we expect our course to cultivate in the child? There

are other essentials which we may cultivate:—essentials to good citizenship, to broader knowledge, to finer personal character, and to success in life. These things must hold our attention yet in the building we may gain an earlier, deeper, and more abiding love of nature which shall also include his fellow man.

The tables outline only the organic field of nature-study, but the author does not mean to exclude the inorganic from practice. The development of man's tools takes us from bone or stone to bronze and steel. The first artificial source of warmth and light was from burning woods or oils,—now the source is from coal or electricity. The ox was at first one of the greatest sources of power, but the modern locomotive is the mightier. The inorganic enters the field of medicine, produces dye stuffs and flavors, and may yet enter the realm of foods. The study of minerals and of physical phenomena must have a share of the time devoted to our work; and they must not be treated as aliens but as closely related essentials.

The tables are far from complete. While the relation of plants to food-supply is treated at first as a matter of plant parts, it should be treated later from the standpoint of plant orders or plant families. It is hoped, however, that the table will be helpful in many ways, by suggesting material for study, the breadth of the field, the historical element, order of presentation, relative values, and final aim or purpose.

SLAVE-MAKING HABITS OF ANTS

BY LOUIS I. DUBLIN, Ph D.

College of the City of New York

Stranger, perhaps, than anything else in the life of the ants is the story of their slave-making habits. The very idea of dependence is opposed to all the activities of these forms among which such strong instincts for productive work exist. It is remarkable, too, that these habits should have arisen in species in which the integrity of the colony is so universally preserved and in which any intrusion from without is so actively resented. Yet there can be no doubt of the existence of this institution among them; for every stage of slavery from the simplest to the most complex conditions is now a matter of easy observation. It is the aim of this account to describe some of the more typical cases of slavery in the order of their increasing complexity, and then briefly to attempt an explanation of their origin and development.

The reader will recall, perhaps, the very common and active red ants known as Formica sanguinea or more familiarly as the sanguinary ants, (Fig. 1). These show the first pronounced condition of this peculiar habit. In the spring the sanguinary queen, just returned from her wedding flight and full of eggs, is most often found in an old nest of a closely related species Formica fusca, surrounded by a small number of queenless workers of the latter species. This is the beginning of the large slave-colonies very common later in the summer. Strange as it may seem, these workers do not resent the presence of the intruder as ants generally do; but feed and protect her with that same loyalty which characterises their treatment of their own queen. Among these she lays her eggs which, carefully tended by the fusca workers, soon hatch into the first lot of sanguinaries. These constantly increase in numbers and make the colony more and more mixed in character. A new composite colony is thus produced in which, through a new division of labor, the good of all is assured. The fuscas or slaves live freely, working without any apparent restraint; but as they are queenless, it is clear that with time they would decrease in numbers while their

younger masters increased. This if continued would, of course, in a comparatively short period lead to the formation of a pure sanguinary colony. In some cases where the sanguinary ants are already firmly established this actually takes place. More often, however, this does not occur; for from time to time the

Fig. 1.—The common red ants, Formica sanguinea, with pupæ. Photographed by Dr. O. S. Strong.

slave-makers make sallies upon neighboring nests, robbing them of their young. Brought into the nest, these serve in part as food, but a large portion always remains to be raised into slavery. By this means is the mixed character of the colony preserved.

In such a well developed community it is interesting to observe

the part played by the two species, respectively. At first glance the black slaves may be distinguished from their somewhat larger red masters. Here and there the former may be observed digging tunnels, "milking" the so-called "ant-cows" or aphids and then feeding the young, cleaning the nests, and in many other ways performing the many domestic duties of the colony. Rarely, if ever, do these duties take them outside the nest and then only in their quest for new aphids. This important activity seems to be entirely in their charge. On the other hand, the masters far

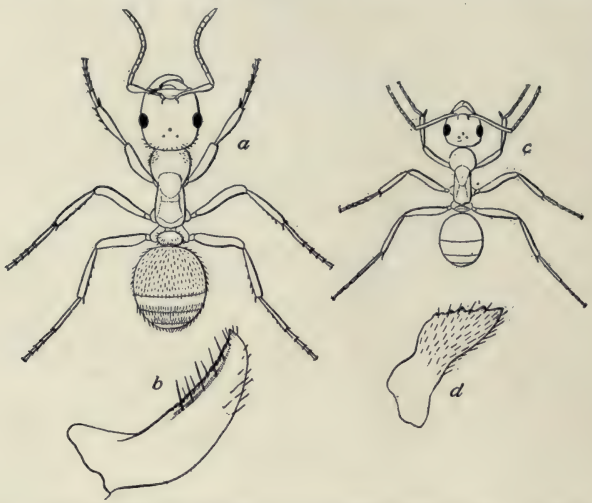

Fig. 2 —*a*, The slave-maker Polyergus and *b*, a mandible of the same. *c*, the Formica slave and *d*, a mandible.

from lying about unoccupied, as might be supposed, take an active part in their own affairs. They seem to be most interested in those activities which relate the colony to the outside world. Thus they determine the migrations, at which times they may be seen carrying their precious slaves from place to place; and they fight their battles and obtain their own food, all of which is no small task when the size of many of these mixed colonies is considered.

Not all the colonies of this species are slave-makers. This is especially true of the American sanguinaries, among which, as Wheeler has shown, the largest colonies are very often pure. This would indicate that as the colonies become more and more firmly established they refrain from the further pillage of

the fusca nests and soon dispense with slavery altogether. These are cases of temporary slavery in which the mixed condition is resorted to only during the most critical period of the foundation of the colony. It may therefore, be concluded that these slave-makers show but little ill effect from the habit. Although they may in this way reap a considerable advantage in their struggle for existence, they are as yet in no sense dependent upon their slaves. The slave-making instinct itself is in this species in an unfixed or formative condition.

Much further advanced is the slave-making habit in the related Amazon ants, represented in Europe by Polyergus rufescens, (Fig.2 a) and in America by the so-called shining slave-maker Polyergus lucidus and some other related varieties. It is safe to say that among these Amazons no slaveless colonies exist, so far has this instinct progressed among them. The colonies begin in much the same way as among the sanguinaries, a young fertilized queen being most probably adopted in a queenless or weakened Formica fusca (Fig. 2c.) or F. rufibarbis colony. With the advance of the season and multiplication of Amazons the number of slaves is maintained and even increased through the robbery of the neighboring nests of these little black ants. The plundering is on a much larger scale than in the preceding instance. Forel, to whom more than to any other observer we owe our knowledge of these forms, calculated that a single colony in the course of one summer captured as many as forty thousand larvæ and pupæ of the unfortunate slaves. Indeed this seems to be the only activity of the ants of this species of Polygerus.

Nothing can be more fascinating than these slave-robbing expeditions. Thus, to quote a well known description from Forel:

"One afternoon at half past three o'clock, the Amazons of a large nest located in a meadow ten steps from a path drew out in a direction at right angles to it; after they had gone obliquely a little, they took the straight path again. Finally, I discovered at a distance of two steps from the army a nest that was covered with Rufibarbis which was at a distance of fifty steps from the Amazon nest. The vanguard of the army recognized that they had reached their destination while they were as yet one decimeter from the Rufibarbis; for they suddenly stopped and sent a crowd of emissaries which with incredible haste rushed back into the main body and the rear guard of the

army. In less than thirty seconds, the whole army is assembled in a mass before the nest of the Rufibarbis, on the surface of which they throw themselves with a second movement of incomparable swiftness. This was not wasted; for the Rufibarbis having perceived the arrival of the enemy the moment the vanguard stopped, a few moments had sufficed for them also to cover the dome of their nest with defenders. An indescribable scuffle now follows, but in spite of it, the greater part of the army of the Polyergus pierces within through all the openings. In the same instant, a stream of Rufibarbis emerges out of the same holes carrying hundreds of cocoons, larvæ and pupae fleeing in all directions * * * The Amazons remain hardly a minute within the nest and come out in myriads from the holes each one with a cocoon, a larvæ or a nymph. But no sooner is the head of the army again on its return than the scene changes once more. The Rufibarbis observing that the enemy is in flight throw themselves with energy in pursuit. They grasp the Amazons by the legs and seek to tear the pupae away from them. If a Rufibarbis attaches itself to a cocoon which an Amazon is carrying, the latter lets her mandibles slip down over the cocoon to the head of the Rufibarbis. In most cases, the latter lets go. If she does not, the Amazon grasps her head between her mandibles and if this does not suffice, then she pierces her head * * * Having reached home, the Amazons bring their booty within and do not go out again on that day. The Rufibarbis also return to their nest with the cocoons which they had saved from the pillage * * * On the next day, at about the same time, these same Amazons plundered the Rufibarbis nest again.''

The captured young, now properly located within the nest, soon hatch and finding themselves in the presence of their conquerors, begin at once to perform those duties which their particular structure or caste makes necessary, precisely as if they had been born among their own kin. No attempt is made to escape, but rather in addition to their own work they now do nearly everything that pertains to the life of their masters.

For the Amazons can do nothing for themselves. The all-important tool of the ant, her mandibles, have been converted into a pair of thin and finely pointed sabres (Fig. 2 b). These are, to be sure, most effective weapons of offence, but as instruments of work, they are quite worthless. The Polyergus ants are thus incapable of digging their tunnels, or of caring for their own young which they produce in large numbers. What is most astounding, however, is the fact that they have lost the power of feeding themselves. It has been most clearly

shown by many observers that if left for as short a period as two or three days without the aid of their slaves they would starve to death, even if surrounded with an abundance of food. Replace the black ants and the scene changes immediately; the Amazons take new courage and are soon fed with the regurgitated food which the slaves are only too eager to offer them.

We may now clearly see the degrading effect of the slave-making habit. Unlike the formicas, both the American and European types of Polyergus are thoroughly dependent upon their slaves. Every aspect of the domestic affairs of the Amazons is dull and lifeless. Apart in one chamber of the nest are generally located the fertile male and females, the others clustering everywhere within the slave-dug galleries, idle and listless. In truth, the so-called slaves are within the nest the real masters. They determine the character of the nest, plan and conduct migrations, carrying the Amazons from place to place, the latter subject to no impulse of their own. An originally fine group of animals is, thus, reduced to a mere band of soldiers and robbers otherwise absolutely unable to care for themselves. The true worker-caste has been replaced by soldiers and all those creative instincts which make the life of the ant-species so strikingly self sustaining seem here to be sacrificed to the mere development of the mandibles as powerful weapons of offence. In America, this once widely distributed species is on the road to extinction. This is certainly a big price to pay. It is the fighting and larvæ-robbing instinct which natural selection has developed. In this alone now lies the secret of their preservation, for there has been developed a fighting organization with which very few other species can compare.

The next stage in this story of degeneration is that presented by a species widely spread over the continent of Europe and known as Strongylognathus testaceus. This is a light-red ant of considerable size and is found associated with a well organized and active little form, Tetramorium caespitum. Like the Amazons, these slave-makers possess ridgeless, sabre-like mandibles which they try to use in much the same way. But altogether they are really nothing more than the merest caricatures of those powerful fighters. In the first place, the very mandibles upon which the soldiers of the latter so effectively

rely are here too weak to do any injury and when a conflict does ensue between them and their slaves, it is the masters that invariably succumb. Secondly, and as might be expected, these degenerate and useless soldiers are very much reduced in numbers. In this species, therefore, the worker-caste has disappeared, and except in name only, the soldiers also. They have become totally dependent.

We are now confronted with the difficult problem of the origin of this mixed colony. Surely the explanation given in the case of the Polyergus colonies cannot apply here. For in many cases at least the slaves are not queenless, and this rules out the possibility of the adoption of the Strongylegnathus queen by Tetramorium orphans. Still more improbable is the perpetuation of the mixed colony through the later plundering of near-by slave nests. It is therefore, necessary to seek some other explanation. In this case it is quite possible that we are concerned with the third type of mixed colony, that is, one that arises through the alliance of two distinct colonies. Two young and fertilized queens representing the two species come together and in a common nest lay their eggs and raise their first batch of young, the bulk of the labor falling on the Tetramorium slaves. But with the growth of the colony a strange fact becomes apparent. The slave-workers apparently affect the small Strongylognathus kings and queens much more than their own larger ones, and as a result we find that while the number of sexual forms of their own decreases, that of the others increases. In this way is very probably produced this mixed colony presenting the peculiar numerical relations of the castes of the castes of both species; the sexual forms of the masters preponderating, while the workers and soldiers are almost exclusively slaves.

This account of the slave-making habits among ants must now be concluded with the final and most complete stage of dependence of one species upon another. This is typified by the European genus Anergates (Fig. 3) and by the recently discovered American species Epœcus pergandei and Epipheidole inquilina. In these forms all the neutral females, that is, the workers and soldiers, have entirely disappeared, leaving only very peculiar males and females to continue the race. In the case of Anergates these are found associated with small numbers

of queenless and aged Tetramorium workers. At first sight such a colony gives the impression that only one species was represented in which the males and females have a strangely different appearance. But in spite of the fact that such polymorphism does actually occur among several species, there can be no doubt that this is not true in this case. Very careful studies have shown that the workers belong to Tetramorium caespitum, the same form described above in association with Strongylognathus; the fertile forms on the other hand, are absolutely unlike those found in Tetramorium colonies and belong to an entirely

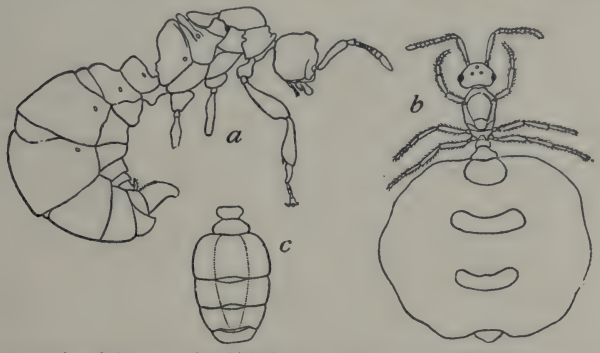

Fig. 3.—A species of Anergates in which there are no workers or soldiers. *a*, male; *b*, fertile female; *c*, abdomen of virgin female. (From Wheeler.)

different genus. These males and females can do nothing for themselves and show rudimentary characters in almost every detail of their structure. The males, for example, are wingless resembling larvae rather than mature ants, while the mouth-parts of both sexes are most degenerate, the jaws and feelers being reduced to mere stumps.

How, then, could a colony such as this have been formed? The problem is made all the more difficult because of the absence of the sexual forms and the brood of the slaves. The colony as a whole is thus incapable of perpetuating itself and the Anergates, entirely dependent upon their aged slave-workers, and therefore, doomed to die with them. The stealing of slaves is out of the question and so also must be considered the possibility of an alliance taking place between representatives of the two species. Very novel indeed is the suggestion made years ago by Sir John Lubbock who in his discussion of this very question wrote: "If the female of Anergates could by violence or poison destroy

the queen of the Tetramoriums, we should in the following year have a community composed of the two Anergates (the king and queen), their young, and workers of Tetramorium, in the manner described by Van Hagens and Forel."

But in view of the structual weakness of the supposed murderess, this too would seem impossible. We must, therefore, once more resort to the adoption-idea as an explanation of the origin of these colonies. Conceive for a moment that an Anergates queen had succeeded in making her way into an old and queenless colony of Tetramorium. As has been experimentally verified, she would most probably be adopted. Once established, she would lay her eggs, which in time would give rise to several males and females that would live on with their queen-mother as long as their Tetramorium slaves survived. On the death of the latter, however, one of the winged females of the new generation might succeed in locating and infecting some new colony and thus repeat the process. Surely no more degraded condition can be conceived.

We have now described the slave-making habit among ants from the simplest to the most complex conditions. At the beginning was the occasionally temporary slavery in which the F. sanguinea indulged and to which no ill effects could be traced. In the Amazons later a striking adaptation toward slave-making was observed, every individual in the colony with the exception of the sexual forms being a soldier or a robber. Most of the constructive instincts, including even the ability to feed themselves, are sacrificed in the race for sharpened jaws. Finally, there are observed those cases where the habit reaches its highest point and becomes sheer parasitism. In Strongylognathus and Anergates the slave-makers, not the slaves, are reduced in structure and entirely dependent, producing a type as far from the self maintaining, active and ingenious ant of ordinary observation as can be imagined.

Let us see what series of circumstances may have led to the formation of this habit. In the first place, it is clear that in this, as in many other biological phenomena, there are several originally distinct factors combined to produce the complex condition. We must, therefore, look for suggestions to the simplest cases where these factors may be found dissociated. In this way we learn to distinguish two elements; first, the founding of the

mixed colony, and second the means taken for its preservation. While the actual founding of the Sanguinary colony has unfortunately not been observed, there can be no escape from the conclusion that this is accomplished through the adoption of the newly fertilized queen of the slave-makers by the workers of an impoverished and queenless colony, whose nest the former has sought out and entered.

Probable as this seems from the evidence already presented, the above account is made even more plausible by the several cases of temporary slavery recently described by both Wheeler and Wasmann from America and Europe, respectively. These observers have found that Formica consocians and Formica truncicola, together with some other forms all closely related to Sanguinea, are incapable of founding their colonies unassisted. The queens of these species have been observed to enter orphaned colonies of other species where they were adopted. More recently the European investigator Santschi working in Tunis on the colonies of Bothriomyrmex, which in like manner temporarily enslave a species of Tapinoma, observed every detail in the adoption of the queen of the former by the workers of the latter species. The young fertilized queens in descending to the ground from their nuptial flight make their way to the mounds of the Tapinomas where they are almost immediately seized by the workers and forcibly pulled into the nest. Once within, the Bothriomyrmex queen falls upon the queen of her hosts and either alone or aided by some of the workers soon kills her. The slave-maker is thus left in undisputed control of the colony. The eggs are then laid and the young reared, the workers acting as slaves; but with the increase in number of the young and the dying off of the slaves the colony soon becomes pure and self sustaining. The similarity of this with what is found in Sanguinea is so complete that there can be no question of the similarity of the founding of both. So too with Polyergus and Anergates. We may conclude that at one time the habit of temporary slave-formation or parasitism was generally distributed among ants and that this probably served as a foundation for the later permanent slave colonies.

It must be apparent, however, that in this way alone no permanent mixed colony could be formed. There must be some way of replenishing the young colony with slaves as the original

ones are removed by death or other causes. This is accomplished by the habit of plundering neighboring colonies. Recalling the simple conditions of the Sanguinaries, the reader will remember the important part this habit played. For considerable periods the colonies seem to be on a continuous slave-hunt, the captured young forming the chief food of the robbers and those that are not devoured being reared into slavery. Many other species not slave-makers at all, like Eciton for example, are constantly guilty of this same habit. So pronounced is this that Darwin in his attempt to explain the slave-making instinct among ants was tempted to look upon this as in itself sufficient to explain the conditions then known. Thus in the "Origin of Species" he wrote:

"By what steps the instinct of Formica sanguinea originated I will not pretend to conjecture. But as ants, which are not slave-makers, will, as I have seen, carry off pupae of other species, if scattered near their nests, it is possible that such pupae originally stored as food might become developed; and the foreign ants thus unintentionally reared would then follow their proper instincts, and do what work they could. If their presence proved useful to the species which had seized them—if it were more advantageous to this species to capture workers than to procreate them—the habit of collecting pupae, originally for food, might by natural selection be strengthened and rendered permanent for the very different purpose of raising slaves. When the instinct was once acquired, if carried out to much less extent even than in our British F. Sanguinea which, as we have seen, is less aided by its slaves than the same species in Switzerland, natural selection might increase and modify the instinct—always supposing each modification to be of use to the species—until an ant was formed as objectly dependent on its slaves as is the Formica (Polygergus) rufescens."

These two habits, then, originally distinct and each widely distributed throughout the ant-world, once combined or rather superimposed in the life cycle of any one species, would give at one bound conditions such as are at present observable in Sanguinea. In the hands of the forces of Natural Selection, coupled with the effects of use and disuse, the later and more complex conditions would in the course of time readily enough arise. It must not, of course, be assumed that the processes of Natural Selection have given origin to this institution. In the field of Instincts quite as in that of Structures, these processes alone can do nothing. There must first be some material basis for

Selection to work upon. In this particular instance, the primary parasitism of the young queen of the slave-makers as well as the secondary plundering habit of her worker offspring are, in their rudiment at least, already assumed to exist. It is their further developments and combination into one distinct activity that Natural Selection has, in all probability, accomplished.

THE NATURE-STUDY EXCURSION

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[Read at California State Teachers' Association at Fresno, Dec. 27, 1906.]

The work in nature-study brings the teacher face to face with perhaps more difficult problems than any other line of school work. And if this be true of that part of the work done in the schoolroom, it is doubly so of the work done in the field. It is the purpose of this paper to define some of the problems which arise in connection with the field trip and to offer a few suggestions to aid in their solution and further to give a few practical suggestions for making the field trip profitable.

Before proceeding to a discussion of these problems I should like to state what to my mind are the chief reasons why the excursion should have a prominent place in nature-study. First, it gives to the pupil a breadth of view such as no other subject in the curriculum affords. To most children school means a room with four walls shutting the outside world out and shutting them in. It means books and paper and pens and apparatus of various kinds. Children are too seldom made to realize that school means anything else or that it has any intimate connection with anything outside of itself, hence they easily become contracted in mind and soul. As a consequence many of them have little appreciation for the things about them in nature and often just as little appreciation for the things of the school. They need the excursion in order to learn that their little schoolroom is only a very minute part of the great school all about them in which they may enjoy the privileges of membership. Second, those parts of the subject which possess for the child the most intense interest mean little or nothing to him unless the question of environment enters in. This is especially true in the matter of protective coloration or protective resemblance, illustrations of which never fail to challenge the admiration of children. The stripes of the tiger and the spots of the leopard are of little significance in themselves, but when it is realized that each of these animals when at home in his habitat is often concealed almost wholly from view by these markings they then contain a world of meaning. Apart from any consideration of

habitat in the case of the ancestry of the dog, the peculiar habit of this animal in turning around several times before lying down has been explained only by saying that he turns once and then since one good turn deserves another he continues the action. But scientific observers noticing that the wolf and other relatives of the dog often execute such motions to make a place to lie down in the tall grass which characterizes habitat, explain it as an inherited instinct. When seen in the aquarium the dark color of the tadpole means little or nothing to the child, but when he has observed time after time in nature that the tadpoles can often be seen only with the greatest difficulty then the color becomes the most interesting thing about this animal.

The first problem which confronts many teachers with regard to the field trip is that of lack of knowledge of the subject. She knows that in the field the pupils will ask many questions which she will be wholly unable to answer and she naturally shrinks from such a humiliation. How shall this problem be met? The teacher must first of all realize that in order to be successful in nature-study and especially in field work with pupils she must possess a knowledge of things apart from books, or at least the aptitude for gaining knowledge from things as well as from books. One of the chief reasons why this subject has fallen into disrepute in many places is that so many teachers had only a book knowledge of the subject and this they sought to pass over to their pupils. We are reminded of Montaigne's words written more than three hundred years ago: "We toil only to stuff the memory. . . . and like birds who fly abroad to forage for grain, bring it home in their beaks, without tasting it themselves, to feed their young, so our pedants (he might now say "our nature-study teachers") go picking knowledge here and there out of several authors and hold it at their tongue's end, only to spit it out and distribute it among their pupils. Nature-study must be learned by the teacher and taught to the pupil while in living contact with the things of nature. Anything less than this is not nature-study. The teacher who finds herself lacking in this knowledge must remedy the deficiency or give up the idea of trying to teach the subject. If she have a love and appreciation for nature (but is without much knowledge) I believe this difficulty will take care of itself as she seeks to

unravel the mysteries of nature with her pupils. She will not then be under the necessity of saying "I don't know" to questions asked, but may say instead, "we will seek to find out." She will thus be enabled more fully to sympathize with her pupils in their struggles to see and understand, and she will necessarily avoid the danger of "shooting over the heads of her pupils."

If the teacher be lacking in an appreciation and love for nature she must seek to acquire these in some way. But how can this be done? It is not always possible to place ourselves in contact with lovers of nature who would be able to impart to us such an appreciation, nevertheless there still remains a way. The old saying, "Books are the best of things well used, abused among the worst," is as applicable in nature-study as anywhere else. Among the vast number of books about nature and nature-study there are a few which though true to life are capable of arousing in us the love for nature which we may lack. Such are the books of William Hamilton Gibson, books redolent with the odor of fields and woods, and written and illustrated with a charm that will captivate all who do not set themselves stubbornly to resist. I am wholly at a loss to understand how any one with even the least imaginative power can read these books, or some of those by John Burroughs, or the volume entitled, "Insects Life" by Fabré (styled by Darwin "that inimitable observer"), or "Our Social and Solitary Wasps" by the Peckhams, without becoming enthusiastic over the study of nature. Besides, among the great number of interesting things mentioned in these books, those which interest us most can be seen by the most ordinary observer, and that, too, in the immediate vicinity of his own home, very often in his own door-yard. My own interest in nature was much quickened when I found by accident the stables which the ants build for the plant-lice and the two-story nest of the summer yellow bird, giving me at first hand the story of how she outwits the cowbird as so charmingly told by Gibson. Such sights are not reserved, as I at one time thought, for the favored few, but are placed within full view of him who has eyes to see and uses them.

Many teachers are hindered by prejudice from entering into a full appreciation of nature. False and unfounded fear of insect larvæ, mice and reptiles must be overcome, or at least greatly modified by the teacher who would be able to instruct her pupils as

she should. One of the great benefits of nature-study teaching is that by it superstition and needless fear are removed from the child's mind and he is thus given a saner and more intelligent view of nature. What an enviable opportunity is mine when I can demonstrate to the child the fact that the dragon-fly is not a "stinger," that he cannot "sew people's ears up," and that he is altogether a harmless, yea, more than that, a defenceless creature; when I can induce the child to prove it to his own satisfaction. What an opportunity lost, if, through timidity or fear, I fail to dispel his groundless fear and superstition. I believe it to be entirely possible for any teacher who has sufficient interest in the subject so to accustom herself to all forms of animal life that she shall be able to give the nature-study lesson in school-room or field without the least show of fear. She *must* do so if she is to succeed in imparting to her pupils one of the most valuable lessons from the work.

Another problem which every teacher in conducting field work must meet is that of class discipline. One of the objections most strongly urged against the field trip is that it weakens and sometimes destroys discipline. *Whether* it does so or not, all depends upon the teacher. It is without doubt true that the teacher's power in that line is either greatly weakened or greatly strengthened by the class excursion. In no other line of school work is there so great need for ingenuity in maintaining discipline as in the field trip and nowhere else has the teacher so great an opportunity for becoming strong in government, for new problems are constantly arising and some of them require unique solutions. To illustrate: On one of our excursions in the Chicago Vacation Schools in which three hundred and fifty children from the slums participated, a number of boys disregarding the customary regulation went bathing in the creek. When discovered and spoken to by a teacher for the first and second times they made not the least show of obedience, but when the teacher quietly stooped and gathered a few stones of a proper size for throwing (the teacher in this instance was a man) there was not a boy among the bathers who did not make all reasonable effort to get to the bank for his clothing. Now, of course, these boys felt almost certain that the teacher would not have thrown the stones, but they also knew that he could have done so if he had wanted to, and knowing that he had a way of enforcing obedience they readily yielded.

Without discipline the most carefully planned trip is likely to come to nought, while a well-disciplined class in the field can hardly fail to learn enough worth the trip even from a lesson without a plan, provided the teacher have an interest in the subject. The progressive teacher will welcome the nature-study excursion as another opportunity for strengthening her powers of discipline. It is the teacher who is always shrinking from new problems in discipline who always finds discipline most difficult. It is by no means an easy task to lay down rules for making discipline easy, for in this so much depends on the personality of the teacher. The study of the individual child has, I believe, done more than anything else to strengthen the teachers' power to control her pupils; not the study of children as they are in school but the study of them when they are their real selves. Nowhere else, unless it be in their games, are children so much themselves as on the field trip; for with competent leadership they become so engrossed in the subject that they forget to be *otherwise* than natural. If the teacher has a lively interest in the subject and each time has the excursion well planned, she will find her power of discipline becoming stronger with each succeeding trip.

The necessity for interference in discipline diminishes with decrease in numbers. It is often possible and many times desirable to divide the class up into small groups, sometimes into pairs. This plan is especially recommended for bird work and has been put to a practical test through some months by Mr. Stebbins, the principal of our grammar room. It is not practicable below fourth grade. Considerable variety may be utilized in dividing up the groups. Pupils may, for instance, sometimes be allowed to choose their own partners; but it is usually better for the teacher to select the partners, choosing in such a way that the stronger students accompany the weaker, the reason for which is plainly evident. The teacher also takes a small group with her and each time a different group until a round of the class has been made. In group work pupils are thrown largely on their own resources and they profit by the work just to the extent that they assume responsibility in the matter. They are made to feel the necessity of looking more sharply for distinguishing marks and are compelled to rely wholly upon their own powers of description. It is well to

precede group work by some drill in the description of mounted specimens, at least until the pupil can name and recognize the limits of the different regions of the body, and has a tolerably definite idea of the commoner shades of color as found in the plumage of birds. He should be encouraged where possible to make hasty sketches, to show any peculiar distribution of color or markings, and to write short, concise descriptions of specimens observed on the trip but unknown to him. If any particular bird is sought, a signal previously agreed upon is given by the group first finding it thus enabling the other groups to gather quietly and study it. Particular subjects may sometimes be assigned to different groups, as for instance: "Watching a bird for ten or fifteen minutes and reporting upon his actions," "A census of all the birds seen on the trip, or in a certain definite locality," "Feeding-habits of certain species."

The day after the excursion should be used for a full and free discussion and comparison of notes and observations. Considerable rivalry is thus stimulated among the various groups and questions will arise which will call for more careful observation at a future time. Sometimes the class may be divided into two equal parts for this part of the work, the intention being to see which side can make the clearer reports. In the same way a pupil on one side may describe a bird as accurately as he can while the other side guess the name of the bird described. Group work in bird study is especially commended because the birds can thus be approached more nearly and the pupils take great delight in approaching the bird by stealth, thinking at the time, no doubt, of the ways of the Indians in approaching the animals they hunted for game. Pupils have been known to become so enthusiastic over the work when conducted according to these plans that it was almost impossible for the teacher to talk with them at intermissions about anything else. Some of these plans slightly modified might easily be used in the field work in general.

In closing I should like to express my faith in the ability of true nature-study to endure the test of time. I should also like to say to the friends of the subject that when our teachers have been more fully educated up to an appreciation of nature and have had opportunity to see its wonderful possibilities when well taught, *then* the movement will take on new life. The excursion will then come to be a part of the regular program and as such will ever be awaited with the greatest delight by teacher and pupil alike.

THE FORESTRY EXHIBITION

JOHN C. DANA

Librarian of Newark Public Library

This exhibition was opened on Friday evening, April 12, 1907, New Jersey's Arbor Day, on the third floor of the Free Public Library of Newark. It includes pictures of trees notable for their size, or their age, or their beauty, or their rarity, or their historic and literary associations; pictures of the leaves, flowers and fruit of trees; pictures illustrating the cultivation, the transplanting, the pruning, and the protecting of trees from injuries by insects and animals; pictures illustrating proper and improper methods of lumbering and the evil effects of improper methods; pictures of insect enemies of trees; pictures of streets, parks and gardens adorned with trees, and of the great forests of the country.

It includes also maps showing our national forests, and others showing the distribution of trees in New Jersey and in the country at large.

In cases or on the walls are shown injurious insects with leaves, bark and wood on which they have worked; wonderful reproductions in wax of flowers and blossoms; leaves of many kinds; a beautiful collection of freshly cut branches from fifty different kinds of evergreens; hickory nuts of many kinds; samples of wood in the form of boards and of veneer; material illustrating every step in papermaking from the log to the finished article, and many of the useful products of trees, like turpentine, varnish, gums, cork, and India rubber.

All these things and many others are so displayed as to be easily examined. Though the amount of material displayed is considerable and though the room in which it is shown is of good size—50 x 150 feet with 250 linear feet of wall surface and thirty glass cases—the exhibition professes to be an outline sketch only and is arranged rather in accordance with the material secured, with the character of the room, and with an eye to its attractiveness to the layman than after a logical plan. It has grown to quite unexpected dimensions from the simple display first planned about six months ago—of a few pictures of beautiful,

curious and historic trees. As it now stands it is the outcome of the interest taken in our original plan by the Forestry Departments of the national government and the several states—very notably New Jersey—; by the Park Commissions of many cities and states—and notably that of Essex County—; by Municipal Improvement Associations, landscape gardeners, nurserymen, botanical gardens, and notably by the Newark Shade Tree Commission.

The first object of this exhibition, as of all those which the Library has held, is to put before the people of our city instructive material in an interesting and attractive way. The city has wisely built for itself a library building—no city has built itself a better one for the purpose—large enough for many years to come and containing many rooms not now needed for strictly library purposes. Exhibitions like this one are here conveniently arranged and seem to come naturally within the library's field of work. The record which follows of 40 exhibits in the past five years with a total attendance of 229,317 shows that the custom meets with approval.

Another object of the exhibition is, of course, to draw attention to the library and to lead our citizens who maintain it to visit it, enjoy it and make use of its books.

A third object—and we hope this will not be thought unimportant because placed last—is to call the attention of young and old to the glories of the trees, their beauty, and the charm they add to the city which possesses them, to the value of our forests as a national asset and to the need of jealously guarding them against those who would selfishly injure them.

The library has many good books on trees, their study and their cultivation, and on all aspects of forestry. It has also many interesting pamphlets, published chiefly by National and State Forestry Departments, for free distribution.

EDITORIALS

LEADING ARTICLES IN THE REVIEW

One of our esteemed readers, who happens to have the ability to write those "sensible abusive letters" which have heretofore been credited with improving THE REVIEW, wants to know why the managing editor does not always place the real "leading" article first in the monthly issues. The reply to him may interest others who wonder why the article which appeals to them as strong is printed second or third instead of first.

The truth is that the managing editor has never attempted to arrange the articles in the order of merit. As a rule the first article is one which has been planned in advance for a certain number. Others equally good, or even better, may come after the printer has begun work on an issue and, following the rule to publish papers as soon as possible, we try to work in many papers received at the eleventh hour. If you want to read the real "leading" article in THE REVIEW, you must read all the 10-point type, and then the one which pleases you best is the leading article. Our arrangement of articles, particularly the use of black-faced type for headings, important sub-divisions, and notes, and with not more than forty pages, makes it impossible that anything important should be overlooked.

INDEX TO VOLUME II

Many inquiries show that the index bound with the February issue has been overlooked. One subscriber writes that he cannot imagine a more stupid place for that index than where it is located and that he cannot imagine how any one could be dense enough to have bound it in Number 2 of Volume III. With this comment the managing editor *agrees heartily* and it exactly expresses the sentiment which he transmitted to the printers whose carelessness caused the absurd blunder. The orders given on the proof and also in a letter were that it should be *inserted but not bound* in the February issue. However, the pages can easily be removed and pasted in the last number of Vol. II.

NAMES WANTED FOR SAMPLE COPIES

The publisher wants at once 1500 names of persons who will probably care to see copies of THE REVIEW. Please send list this week if possible; but names for sample copies are gladly received from subscribers at any time.

MANUSCRIPTS SHOULD BE CORRECT

Corrections in proof have become very expensive and so hereafter the editor must ask contributors to take special care in revising manuscript before setting in type. Changes in proof which are not the fault of editor or printer will be charged to authors at the rate of three cents for every line in which a change, even a comma, occurs. This is the average expense to the editor.

PROFITS OF THE REVIEW

A reader, who in December last cancelled her subscription "because a friend also takes THE REVIEW," asks the question, "Who gets the profits from THE REVIEW. It has been widely advertised as a coöperative journal, but surely somebody is making money out of it. My friend, who is a printer, tells me that 2000 subscribers at one dollar means profit."

In answer to such readers who demand an accounting, the managing editor begs to say: (1) that there is profit in 2000 subscribers at $1.00, but that so far many of these 2000 possible subscribers have, like the writer of the letter mentioned, decided to help the movement by using a friend's copy or borrowing from a library. Moreover, the average of $1.00 per subscriber is purely theoretical, for a large number of subscribers send their periodical orders to agencies which charge a commission; in fact two large agencies practically demand 50% on new subscriptions as the price for listing THE REVIEW in their catalogue. Finally, in order to settle all doubts concerning profits, the managing editor stands ready to open to the inspection of any one interested the books and vouchers proving that up to date THE REVIEW has cost the managing editor personally nearly one thousand dollars for printing, advertising and clerical assistance. The deficit in the first year was approximately $650, last year $250, and so far this year $100. This personal loss

cannot be carried longer than the end of this volume. If the new Nature-Study Society of 1000 or more members will adopt the journal as its official organ, THE REVIEW will pay expenses for printing, postage and clerical work. Or 300 additional subscribers would make good the present annual loss; but to add 300 permanent subscribers without going into the field of popular nature-study and ceasing to be a journal for research in nature-study is apparently impossible, unless more individual subscriptions supplement existing library subscriptions. The managing editor is always glad to have useful suggestions, particularly on the financial problems which are prominent in the case of most special magazines which must depend upon subscriptions.

RECENT (1905–1906) BOOKS IN NATURE-STUDY AND SCIENCE

Log of the Sun. By C. W. Beebe. A chronicle of nature's year. 52 full page plates, numerous text figures. New York: **Holt & Co.** 1906. $6.00.

Darwinism and the Problems of Life. By Conrad Guenther, translated by Joseph McCabe from third German edition. A study of familiar animals from evolution viewpoint. Pp. 436. New York: **Dutton & Co.** 1906. $3.50.

Real Things in Nature. By E. S. Holden. A reading book of science. Pp. 443, 408 figs. New York: **Macmillan Co.** 1902, reprint 1906. 65 cents, school edition, 50 cents.

Familiar Wild Animals. By S. A. Lottridge. A reader for children. Pp. 115, photographs. New York: **Holt & Co.** 1906. 60 cents.

Bird World. By Stickney and Ralph Hoffman. A reader for children. Boston: **Ginn & Co.** 1906. 60 cents.

How Ferns Grow. By Margaret Slosson. A study of the development of form and variation of fern leaves. Pp. 156, 46 plates. New York: **Holt & Co.** 1906. $3.00

Good Health. By Frances Gulick Jewett. The first of a series of five books on hygiene for elementary schools. Pp. 172, illustrated. Boston: **Ginn & Co.** 1906. 60 cents.

Renewal of Life. By Margaret W. Morley. How and when to tell the story to the young. Pp. 200, illustrated. Chicago: **McClurg & Co.** 1906. $1.25.

Agriculture Through Laboratory and School-Garden. By C. R. Jackson and Mrs. L. S. Daugherty. A text-book of elementary agriculture. Pp. 403, 150 figs. New York: **Orange Judd Co.** 1905. $1.50.

Biology of the Frog. By S. J. Holmes. A text book for colleges. Pp. 370, 94 figs. New York: **Macmillan Co.** 1905. $1.60.

How to Know Wild Fruits. By Maude S. Peterson. A guide to trees and shrubs. Pp. 340, illustrated. New York: **Macmillan Co.** 1905. $1.50.

Practical Physiography. By H. W. Fairbanks. A text-book for the high school. Pp. 542, 403 figs. Boston: **Allyn & Bacon.** 1906. $1.60.

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THE JOURNAL OF GEOGRAPHY

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THE NATURE-STUDY REVIEW

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September, 1907

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DEVOTED TO ALL PHASES OF NATURE-STUDY IN SCHOOLS

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THE
NATURE-STUDY REVIEW

DEVOTED TO ALL PHASES OF NATURE-STUDY IN SCHOOLS

VOL. 3 SEPTEMBER, 1907 NO. 6

THE AMERICAN NATURE-STUDY SOCIETY

The number of applications for membership in the proposed society for nature-study now justifies the making of definite plans for completing organization. It is true that the list is still far short of the one thousand names suggested in the March issue of THE REVIEW as desirable for a beginning; but the daily stream of applications for membership makes it probable that many more than one thousand will be registered before the end of this year. However, the plans for the new society have not yet been widely advertised and it is highly desirable that those already enrolled take an active interest in the work of increasing the membership. For convenience in reaching those who do not yet know about the proposed society some small circulars intended for enclosing in letters have been printed and will be mailed from the office of THE REVIEW to any reader who will help distribute them. One person enclosed these circulars in nearly one hundred letters and secured over thirty names for membership.

Organizing Committee.—It was suggested in the March REVIEW that applications for membership should be accompanied with nominations for ten members of an Organizing Committee. Very many letters have contained such nominations and the names given below have received the largest number of votes.

Professor L. H. Bailey, of Cornell university; Professor C. F. Hodge, of Clark University; Professor O. W. Caldwell, of the University of Chicago; Professor Stanley Coulter, of Purdue University; Dr. H. W. Fairbanks, of California; Professor V. L. Kellogg, of Stanford University; Mrs. A. B. Comstock, of Cornell University; Professor D. Lange, of the St. Paul schools; Principal W. A. Baldwin, of the Hyannis Normal School; Professor

M. F. Guyer, of the University of Cincinnati; Professor F. L. Stevens, of N. C. College of Agriculture; Professor W. Lochhead, of Macdonald College; Professor M. A. Bigelow, of Teachers College, Columbia University; Professor C. R. Mann, Department of Physics, University of Chicago; Mrs. L. L. Wilson, Philadelphia Normal School; Dr. E. F. Bigelow, Stamford, Conn.; Professor J. F. Woodhull, Teachers College, Columbia University. No attempt has been made to arrange names in order. There are more than ten names because, with five or or six exceptions, it has proved impossible to select on the basis of majority of votes; and also all the above are needed to give proper geographical and institutional representation. The above names will certainly be approved as satisfactory for a committee on organization; and in order to push plans to completion the managing editor of THE REVIEW has asked these persons to cooperate in making definite plans for organization of a society for the advancement of nature-study in schools. The proceedings of this committee will be published as soon as possible in THE REVIEW.

Meeting for Organization.—It has been suggested that a meeting for organization should be held in Chicago when the national scientific societies meet next December. No other meeting will bring together so many who are interested in nature-study, and therefore, the suggestion seems to be a good one. The suggestion will be referred to the Organizing Committee.

The Official Journal.—Concerning the proposition to make THE REVIEW the official journal, it has been suggested that it should be in the control of the association and the editor or editorial committee elected. To this the present editor and publisher will agree, and will later submit a proposition involving the above suggestion.

Membership fees paid for 1907.—The announcement last March brought a large number of applications for membership accompanied by $1 orders and checks for membership fees. In most cases it was requested that The REVIEW should be sent beginning with January 1907. After July all remittances accompanying applications for membership will be credited to membership dues for 1908, and THE REVIEW will be sent beginning with next January, unless specially ordered according to the following notice.

THE REVIEW will be sent for the *last four months of 1907 for 30 cents*. This will accommodate those who wish to get all numbers before January when the magazine will be sent free to members of the Nature-Study Society. This offer may be used by all who have recently subscribed for THE REVIEW at the regular price, and who may want the dollar paid credited to membership dues for 1908.

The red mark on the address-label of this and later issues means that your name has been placed on the membership list. If your copy is not marked, kindly notify the managing editor of THE REVIEW.

THE AIMS OF NATURE-STUDY

BY ELLIOT R. DOWNING

Northern State Normal School, Marquette, Mich.

Centuries are marked more by the ideas that dominate them than by the deeds they accomplish. The Iliad gives immortality to its heroes. Aristotle is infinitely more forceful now than the great Alexander. The idea of evolution is the nucleus of the nineteenth century thought. It has absorbed the hitherto unorganized accumulation of facts and constructed them into a vital whole. Its influence has permeated all departments of knowledge, catalytically reconstructing astronomy, biology, geology, history, sociology, psychology, child study, pedagogy, and theology. It has enabled us to express old truths in more cogent terminology, to organize successfully the attack upon the unknown, to apprehend more completely and align ourselves more perfectly with "the one increasing purpose which through all the ages runs."

We realize now that children are not little men and little women but that the development of the child is a change in kind as well as in degree, a change as marked as the phylogenetic transition from worm to monkey. The mental life too is an evolution. The powers of mind appear successively dominant, contemporaneously with definite physical changes. (1) A period of rapid physical growth of brain and other bodily organs is accompanied by the rapid accumulation of sense percepts and their utilization in imagery. It is a time of nervous instability, of susceptible emotions, of developing will when control is best achieved through the feelings. This period culminates in and apparently is terminated by the second dentition. There ensues (2) a pause in the growth. The physique fills out. Energy is superabundant. The organism reaches a maximum of resistance to disease. The brain cells are developing their connecting processes. Powers of association are at their best. Hence this is a time for the correlation of sense percepts, for memory, for the formation of physical habits. The individual is phlegmatic if ever. Control must be authoritative. (3) Then follows the adolescent period, the second period of intense change with the

culmination of new powers both physical and mental. Reason and judgment become ascendent and volition must needs be controlled through them.

The stages through which the individual passes in his mental development are recapitulated in the history of every judgment which we form. Sense percepts form the foundation for all of our mental processes. Upon these we build our judgments by synthesis, correlation and reasoning. It is evident then that accuracy of sense perception, the most efficient power of observation, is important always, since it is so fundamental; but that the appropriate time for its intense cultivation is early childhood, not because its absolute importance decreases in later life but it becomes relatively less important, since the later mental powers come to occupy a larger place.

These considerations lead to the conviction that one aim in nature-study should be the development of the power of observation—not of eye alone but of all the senses. Further, that this work should assume large proportions in early childhood in view of its dominant place in the mental life of that period. During the second period we may continue, in lessening amounts, this fundamental drill and add the accumulation of facts and statements of laws. Not until the adolescent period should we expect the child to reason closely on the facts he has in mind.

We come to understand, in part at least, the tendency to differentiate science and nature-study when we realize this difference in mental aptitudes with advancing years. Certainly the systematic marshalling of facts and their rational interpretation, which we commonly designate science, will belong to the later school years and we may appropriately apply a different name to that study which aims simply to train the powers of observation.

We have neglected too long in our modern school work incessant drill upon this fundamental step in all mental operations. The race spent its apprenticeship in savagery sharpening its powers of sense perception. The individual does well to go much and often to the same instructor, nature, to keep keen his powers for the conflict of life. While the struggle for existence has risen to a higher plane and new powers are involved, they are in addition to, not in place of the old. Indeed modern business and professional life demands accuracy of eye, ear and muscle more

frequently, of the novitiate at least, than excellence of judgment. It is lack of this training that exposes the high school and college graduate to the charge of impracticability. There is no dearth of training in memory, reasoning and the formation of judgments, but little or no training is given on first-hand acquisition of the sense percepts upon which these depend.

Not alone does nature-study and the later science work afford superior opportunity for sensory training but it gives an unexcelled opportunity for drill in the complete thought process, the formation of judgments on the basis of sense percepts which the student himself has secured. In most school subjects the judgments which we call upon the student to make are formed from borrowed concepts not from those that he builds for himself. Perhaps the judgments themselves are reasoned out for him and he is required merely to give his assent or to simply memorize them. In every-day life, however, the situations which we must successfully meet or face ignominious failure are not enigmas with half the explanation written upon them, but problems which we must master from the elemental sense percepts, to the final judgments expressive of the solution. This is impossible in some valuable studies because original sources are inaccessible. But it is the glory of nature-study to deal with the very commonplace.

Nature-study has a still more significant content. The nature-study movement is no evanescent, educational fad, but a permanent product of fundamental forces operative in the intellectual and social evolution of the race. In recent years this evolution has been so rapid as to amount almost to a revolution. It has multiplied schools, increased attendance and remodelled courses. It has opened the schools not alone to the favored few but to the ambitious masses. It has established the polytechnic and agricultural schools, introduced manual training and commercial courses, often replaced the classical by the science course and developed the demand for nature-study. These significant changes indicate that the schools are trying to serve a new constituency.

A century ago the average child might not go to school beyond his tender years. He was required as a producer. Now mighty steam and deft electricity have supplanted human brawn and supple fingers and freed the little laborer from the slavery of commerce. The industrial revolution produced by the change of

power from muscle to steam made possible and necessary the revolution in education though the effect was long delayed by expensive war and social inertia. A single engine frees a hundred laborers and multiplies by just so much the productive power of one operator.

This industrial emancipation has made education possible for the masses who come demanding that with the least possible expenditure of time, money and energy there shall be provided a course as effective from the educational standpoint as the classical but made up of those studies that have a distinct wage-earning value. Nature-study comes to us as a part of this popular, practical, scientific movement. The commonplace objects are its appropriate subject-matter. It affiliates with gardening, agriculture and other commercially valuable subjects. Yet its purpose is not primarily commercial. Its aim is not to teach the farmer lad how to win a few more bushels of grain from a relcutant soil nor the would-be carpenter how to select his timber more profitably. While the demand for nature-study has come from the practical masses its aim is to put into the commonplace objects a spiritual significance, to fill them with the suggestions of the vast import that the world's master minds have seen in them, to insure their recall of the vision of the seer, the inspired interpretation of the artist and poet.

"How wearily the grind of toil goes on
Where love is wanting, how the eye and ear
And heart are starved amidst the plenitude
Of Nature.
* * * *
And, in sad keeping with the things about them,
Shrill querulous women, sour and sullen men,
Untidy, loveless, old before their time,
With scarce a human interest save their own
Monotonous round of small economies,
Or the poor scandal of the neighborhood;
Blind to the beauty everywhere revealed,
Treading the Mayflower with regardless feet;
For them the song sparrow and the bobolink
Sang not, nor winds made music in the leaves;
For them in vain October's holocaust
Burned gold and crimson, over all the hills,
The sacramental mystery of the woods."

Nature-study embodies a protest against the mere intellectual

apprehension as well as the purely commercial appropriation of nature. Our scientific texts and the bulk of our scientific instruction have been negligent of the development of the will and emotions. They have centered effort on the production of intellectual keeness. Science is a statement of bare facts,—a cold, impartial, uncolored recital of truth. This is inadequate for the complete education. It lacks interest. It fails to stir the emotions, to stimulate the will. It does not recognize an important soul power, faith. But add to the scientific knowledge of fact, the artist's joy in beauty, the glamour of poetic interpretation, the raconteur's literary style, the interest of human kinship and utility and it makes subject-matter in which the imaginative child soul revels.

Nature-study supplies in part at least that element of culture and spiritual uplift in modern scientific education which the older classical courses gave by virtue of the student's contact with the splendid thoughts and sturdy heroes of the classical literature.

Nature-study aims at an ennobling, inspiring, healing companionship with nature rather than mere knowledge of nature. The love of nature is the goal; the moral uplift is the ultimate desire. Humanity owes much to these friendships with nature. They have been the source of inspiration for poets, moralists, reformers, a never failing fountain of perpetual youth for the world's great toilers. The exquisite Lake region of England and our own charming Concord valley have stamped their character on the literature of a brilliant period because they have moulded the characters of the poets and philosophers their beauty has inspired. Every religion has drawn on nature for parables and the great religious leaders have spent years apart meditating amid the suggestive voices of nature. Man's worship of God has evolved from a worship of nature. Religion has been conceived of the solitary places. Freedom has been nurtured by the hills. Literature and art have been cradled in the lap of Mother Nature. That which is true of the race is true of the individual. Sturdy character is the gift of the sun-flecked forests the rushing river, the eternal hills.

"By the breadth of the blue that shines in silence o'er me,
By the length of the mountain lines that stretch before me,
By the height of the cloud that sails with rest in motion
Over the plains and the vales to the measureless ocean

(Oh, how the sight of the things that are great enlarges the eyes!)
Lead me out of the narrow life, to the peace of the hills and the skies."

We may not retain in the school curriculum any subject unless it accomplishes some object of education better than any other subject and contributes also to the whole purpose of education. Nature-study is incomparable in its training of the powers of observation, unrivalled as discipline in the complete thought process and an exceptionally powerful factor in the moral and religious development of the individual and the race.

PLAN OF ORGANIZATION FOR NATURE-STUDY FACTS*

BY JOSEPH S. TAYLOR, Pd.D.

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The defects which the writer has found in nature-study teaching may be roughly divided into two classes: Defects of organization and defects of expression.

(1) *Errors of Organization*—The syllabus of nature-study in the New York public schools calls, in the first five years, for a mass of facts, of which the following for Grade 1 A is a sample:

"FOUR-FOOTED ANIMALS: Cat, mouse, rabbit. Recognition and name; observation of their characteristic movements and actions; their color, covering, food, uses, and care of young."

There is no suggested organization of the facts, and the consequence is that when a supervisor enters a class-room and asks for a recitation or a lesson on any given animal or plant, the following procedure is the rule: There is attempted a mere enumeration or heaping up of actions, qualities, parts, and uses, without regard to rhyme or reason. If the animal under consideration be the duck, for example, one pupil says the duck is a bird, another says she has a bill, another that she has feathers, another adds that the bill is yellow, and still another that the bill is broad. But there is no attempt at orderly sequence, no separation of significant from trivial facts, no effort to relate facts of structure to facts of function. Every fact is an isolated, unrelated thing, which has to be mastered by sheer force of memory. The consequence is that in a few days the information slips away, and when children are asked to tell what they remember of an animal, they stare at you in bewildered silence. They can't remember which of the hundred or more independent facts that were told to them comes first. In fact, there is no necessary first or last; one could begin anywhere to recite the long catalogue of names without doing violence to the arrangement.

(2) *Defective Expression*—The second error of teaching which the writer has found almost universal is lack of drill in the correct expression of facts taught. Perhaps it were more accurate to say

* Copyright by Joseph S. Taylor, 1907.

"facts told;" for a thing cannot properly be said to have been *taught* until the pupil can *adequately express* the same.

A lesson in nature-study usually consists of the enumeration, by the teacher, of the facts called for. This is true even in cases where the actual object is at hand. When the pupil is asked to reproduce what he has learned, the teacher puts a question calling for a single fact, which the pupil answers with a monosyllable. It does not seem to occur to either teacher or pupil that a child can state more than *one* fact. It does not occur to teachers, as a rule, that the information about an animal or plant can be woven into a story, and that a child can reproduce such a story from start to finish as well as he can tell fairy tales and folk stories. The fairy tale can be remembered because there is sequence of time as well as of cause and effect in it. Things proceed in an orderly way. There is a firstly, a secondly, a thirdly; and these steps must follow in the correct order, else the story is ruined.

Is it possible to organize nature-study facts in such a way that there is sequence and necessary order? The writer ventures to answer this question in the affirmative.

The following scheme is based on the well-known fact that children are concerned chiefly with the *function* or *use* of an object and care little about *parts* and *qualities* as such. The latter items are, therefore, considered only in so far as they relate to the mode of living of the animal or plant studied. The plan provides a *causal series* for nature-study similar to that which we now have in geography in the 5 B and higher grades. The facts are to be presented in *story form*, and the child is not required to be conscious of the causal series. But if the facts are presented in the manner proposed, they are scientific facts and will not have to be unlearned at a later stage of the child's development. The *human relation*, which should also be emphasized, is always an incident of the *mode of living* of a plant or animal. For instance, the silk-worm, in the course of his life-history, spins a cocoon, which happens to have great commercial value. The potato-bug likes the leaves of the potato plant for food, hence, in a single year the insect destroyed potatoes valued at $73,000,000 in the State of Illinois alone. When the child recites, he should give the facts in *story form*, and should group all items under the two heads, *care of self* and *care of young*. An animal or plant has two things to do in this world, and only two—he must make a

living for himself and bring up a family. The perpetuation of the species seems to be, from the point of view of life, the supreme end of existence for these humble brethren of the field and forest. The female of many insects, for instance, lives just long enough to lay her eggs, and then perishes. It is therefore proposed to adapt the following outline to each animal or plant studied in the grades of the first five years:

I. General Formula*—The Business of Animals and Plants.

1. *To Care for Themselves.* (a)Food: finding, securing, transforming. (*b*) Self-protection. (*c*) Adjustment to physical surroundings. 2. *To Care for Offspring.*

II. Business of a Cat—Adaptation of the General Formula.

1. *Care of Self.* (*a*) Food: (1) Information: feelers, eyes, ears, etc. (2) What: meat, mice, etc. (3) How it laps milk; how it catches mice. (4) Cleanliness, etc.; how it cleans itself; dislike of water on its body. (5) Work: day or night? (6) Food habits: friend or foe of man? (*b*) Self Protection: (1) Ememies: how it escapes; runs, climbs a tree, etc. (2) How it fights: claws. (*c*) Adjustment to Physical Surroundings: (1) Lives on ground. (2) Fitted: run, jump, very quick; soft footsteps; claws; sharp teeth. (3) Protected against cold and heat; sheds fur in spring; heavy coat in winter.

2. *Care of Kittens.* (*a*) How fed. (*b*) Provision for safety: carries away and hides them. (*c*) Taught by parents? (*d*) How long for babies to grow up? (*e*) How long does it live? (1.) Treatment of cat at home; on street; kindness; playmate; pet.

III. Business of the Burdock.

1. *Care of Self.* (*a*) Food: from air, hence *leaves*, from earth, hence *roots*. (1) No organs of locomotion; hence cannot go after food. (2) No sense organs, since no use to get information at distance. (3) Friend or foe? Leaves used as cooling application in swellings; roots and seeds in blood and skin diseases. (*b*) Self Protection: (1) Competitors for favorable position: manured soil. (*c*) Adjustment to Physical Surroundings. (1) Long stem to avoid shading, etc.

2. *Care of Offspring.* (*a*) Propagation: burs which hold tenaciously to dress of man or fleece of animal. (*b*) Storage of food in seed for baby plant.

*Michael F. Guyer, University of Cincinnati, in *Pedagogical Seminary*, Vol. XII, p. 87.

IV. Business of the English Sparrow.

1. *Care of Self.* (*a*) Food: (1) Information: very sharp eyes, able to see seeds, insects, etc., at long distance. (2) What: grain—wheat, oats, rye, rice, buckwheat, etc.; fruit—grapes, cherries, plums, apples, pears, peaches; garden vegetables—peas, corn, lettuce, cabbage. Will not eat insects, if he can get grain, etc. (3) How it flies from place to place in search of food; hops; runs; bathes; rolls in dust. (4) Work: day or night? (5) Food habits: foe of man; eats farmer's grain, fruits, etc., and does not eat the caterpillars that destroy his trees.

(*b*) Self-Protection: (1) Enemies: how it escapes—by flying. (2) How it fights: sharp bill and sharp claws. Drives out native birds like robin and wren. While parents of baby robins or wrens are out looking for food, the sparrows will go to the boxes and pull out the young featherless birds and kill them.

(*c*) Adjustment to Physical Surroundings: (1) Found all over this country; protected by feathers against cold; stays all winter.

2. *Care of Baby Birds:* (*a*) Its home: rough and loosely made of straws, sticks, etc. (*b*) Lays 4 to 7 eggs. (Size and color.) (*c*) Hatched in 12 or 13 days. (*d*) From 4 to 6 broods in a season, from January to September. (*e*) Thus in New York a single pair may rear from 20 to 30 young in one season.

Note.—The introduction of this pest is credited to Hon. Nicolas Pike and others, directors of the Brooklyn Institute, who imported eight pairs in 1850. It was introduced into many States by legislative enactment under the mistaken notion that it is an insectivorous bird and thus a friend of man. It is now known to be one of his worst enemies, inasmuch as it destroys his fruits and grains and drives out native birds that are a benefit to man. The question, therefore, arises, What shall we say about the sparrow to little children on the score of his relation to man? We want to teach kindness to animals; but here is an enemy. How far shall we dwell on this feature and thus arouse the child's feelings against the creature?

V. Business of the House Fly.

1. *Care of Self.* (*a*) Food: (1)Information: wonderful eyes; sense of smell. (2) What: dirty foods, various kinds of filth; in the house it eats sugar, milk, etc. (3) How it eats: proboscis, something like a tongue with which it laps up food. (4) Work: day or night? (5) Food habits: friend or foe of man? We are obliged to screen our doors and windows to keep it out. Specks everything, crawls over our food, falls into our milk and cream, etc.; eats and breeds in filth, and thus carries disease. (*b*) Self-Protection: (1) Enemies: how it escapes. (2) Does it fight? (3) Has it a home? (4) Does it lead a solitary life, or is it in a community? (*c*) Adjustment to Physical Surroundings: (1) Lives on ground; can walk on side of wall or ceiling with its six legs; how? (2) Where does it go in winter? 2. *Care of Young.* (*a*) Lays its eggs in manure or door-door-yard filth. (*b*) Lays as many as 100 at a time. (*c*) The eggs hatch

in a day—a *larva* or *maggot*. (d) Larva grows from 5 to 7 days; then *pupa* (cocoon). (*e*) Pupa from 5 to 7 days; then fly. (*f*) Thus in from 10 to 14 days a generation of flies is born; and we see how from a few in spring we have swarms in summer. (*g*) No one knows how long a fly lives; probably a month or six weeks.

The above list of adaptations includes a mammal, a bird, an insect, and a plant. These illustrations are sufficient to show that the general formula has universal validity.

Further adaptations of the formula to the various animals and plants of the different grades are earnestly solicited from teachers and principals.

Relation of the Proposed Plan to Observation

It must not be inferred from the method here described that objective teaching is to be abolished. In the lowest grades, only living things are to be studied, and as far as possible objects that can be brought into the room.

This is obviously impossible in the case of some animals, as for example, the horse and the cow. Here the model or picture must be employed.

If the object can be brought into class, models and pictures may be used after the reality has been studied. So also books should be introduced after the thing, to supplement the information obtained at first hand.

As many as possible of the facts it is proposed to teach should be observed by the child, under the direction of the teacher. Some information must be taken on the word of another; such, for instance, as the number of eggs a bird or fly lays and the number of days it takes to hatch them. If the instruction is limited to facts that children themselves can observe, it is necessarily incomplete, unsystematic, and largely worthless. The mere presence of the reality is no guarantee that they learn anything worth knowing.

Professor Bailey has said somewhere, in effect, that nature-study is seeing what we look at and making proper inferences about what we see. His own pamphlet on "Four Apple Twigs" is an illustration of his definition. The untrained eye sees in those twigs nothing but dead branches. But he reads in the buds and scars a wonderful story of the life and work of the tree. We must not expect children to see as much as Professor Bailey sees, or as the teacher sees, or even as the adult layman sees. The mind sees with what it knows, and children know so little. Therefore, in any case, observation must be supplemented by the more

enlightened seeing of the teacher. Even in high schools and colleges, students receive minute directions as to what to observe and are assisted by suggestive hints to make proper inferences.

The facts, then, may be gained by observation, suggestion, or direct telling. What is proposed here is that in whatever manner they are acquired, they shall be organized into a consistent body and put into a form suitable for ready expression. The *story* is to gather up what has been learned, and is to put it into compact and attractive form for storage and transmission. The pupil must not only know but must be able to tell what he knows; and it is almost safe to take the position that what he cannot express he does not know. There are, of course, subjects in which this is not true. Music, literature, art of any kind, noble conduct, religious appeal, may influence a child emotionally and give him an artistic or ethical bias which, though these things constitute real education, he cannot express. But information is different. This is not knowledge unless he can formulate and utter it.

In conclusion, the author begs to request that all suggestions, stories, results of experiments, etc., be addressed to Joseph S. Taylor, P. S., 4, 173d Street and Third Avenue, Bronx, New York.

[EDITOR'S NOTE. This article is also published for local use in *School Work*, New York City, which also gives several specimen stories.]

NATURE-STUDY AND PHYSICAL SCIENCE

BY GEO. P. SINGER

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[EDITOR'S NOTE.—The following is an abstract of an address by Professor Singer before the Pennsylvania State Educational Association. More of the address is published in *Penn. School Journal.*]

"Now what I want is facts. Teach these boys and girls nothing but facts. Facts alone are wanted in life. Plant nothing else and root out everything else. You can only form the minds of reasoning animals upon facts. Nothing else will ever be of any service to them. This is the principle upon which I bring up my own children and this is the principle upon which I bring up these children. Stick to facts, sir." So Dickens, the master of pedagogy, introduces Thomas Gradgrind, " A man of realities, a man of facts and calculations," the chief personage in "Hard Times," which was written as Dickens' earnest protest against the science then taught in English schools.

I fear the story of Sissy Jupe, the jocky's daughter, and her experiences in Gradgrind's school has far too many parallels in our own schools today where the nature-study period is too often used for instruction in elementary science which the teacher has read from a so-called nature-study book and which she demands to be reproduced in an oral or written lesson.

How shocking that Sissy could not form a definition for a horse when the master called upon her the first day she was a pupil in the school! What appalling ignorance! And how scientific the answer of Bitzer, the bright boy: "Quadruped, graminivorous, forty teeth, namely: twenty-four grinders, four eye-teeth and twelve incisors, etc., etc. Hoofs hard but requiring to be shod with iron; age known by marks in the teeth." Sissy Jupe not know what a horse is? Why she knew everything about their habits and dispositions; loved them dearly, as they had been her daily companions for years. Well might Gradgrind, Bitzer and M'Choakumchild sit at her feet and be instructed by her on this subject from the standpoint of nature-study, than to hold her up as an ignoramus in the facts of natural science.

[Here Professor Singer quoted and discussed paragraphs by

Hodge, Fairbanks, Stevens, and Bigelow in THE REVIEW, Vol. I, No. 1, Jan., 1905.]

The fact that physics and chemistry are not generally drawn upon for materials for nature-study work, while botany and zoology are exhausted almost to the condition of a vacuum by some of the text-books, is my apology for indicating a few practical lessons which I hope may be suggestive and illustrative of my contention that nature-study is most closely related even to physics and chemistry, the generally considered formal sciences. Is it not a fact that the home environment of every child abounds in physical and chemical facts which will appeal to his interest and curiosity equally at least with any facts he may note concerning plants and animals? The motion of the mercury in a thermometer brought from the winter air into the warm room; the motion of the water when the spigot is opened or when the pump handle is lowered; the movement of the kite or toy balloon are just as interesting to the child, if not more so, than the hopping of the toad, waddling of the duck, or snapping of the jewelweed pod. The fact that "things in motion sooner catch the eye than that which does not stir" is as strong an argument for physical and chemical nature-study as for biological nature-study, as is pointed out in a paper read by Professor Hallock before the New York Science Teachers' Association in 1904. (Bull. 28, Oct. 1905, N. Y. State Ed. Dept.)

In a class in science some years since, I was asked this question while we were discussing center of gravity: "Can you stand an egg on end?" Instantly my class was on the qui vive. My reply was that I could not and that I thought no one could unless they played the trick of Columbus. Imagine my surprise when the next recitation the students brought half a dozen eggs to my class-room and stood them on end on a pane of glass which was on my lecture table. Verily, to see is to believe. This I deem a valuable experiment in that it will catch the interest of every boy and girl in the school and very few will be content to give up until they too can balance the egg—an excellent education to the muscular sense, nerve control and patience. The cigarette smoker in the school can hardly succeed, which is a practical lesson in hygiene that will not be soon forgotten.

It is not the purpose in the nature-study relation of this scientific fact to go into the details of center of gravity, unstable

equilibrium or the laws of equilibrium. The visible fact that an egg will stand on end, and that, too, on the smaller end, and that the boy or girl can make it stand, is a strong appeal to the interest of the child and gives opportunity for the earnest teacher to draw out a good many principles as to correct habits of walking and standing. But first learn to balance the egg before you teach this lesson.

A young lady called my attention to an interesting modification of the Cartesian diver experiment of the text-books. A homeopathic vial half filled with water so that it floats when inverted in water is put into a pint flask filled with water and the flask tightly corked. The slightest pressure on the sides of the flask causes the vial to sink to the bottom, and it will come to the top or remain at the bottom or half way up, as the pressure is varied. I have never known this to fail to interest a class, and the important suggested lesson is that every boy and girl in the class will float in the water just as truly as the vial; that they cannot drown unless water gets into the lungs and makes them sink, therefore, if accidentally thrown into the water, teach them to lie on the back and not to breathe unless the nose is in the air, and the mouth is kept shut, for so they cannot sink. How much more valuable this lesson than any that can be taught about plants or animals?

Make children absolutely sure that they are floating bodies naturally and how quickly they will learn to swim. This experiment suggests also the swimming of fishes, the principle of the balloon, the fact that skim milk is heavier than new milk, in fact so many interesting things that the teacher can use it for a series of lessons, all valuable in the extreme in the after-life of the pupils.

A senior in our model school took a dozen large needles, a spool of thread and a small magnet to her class-room, had the pupils magnetize the needles by drawing them eye to point over the south pole of the magnet and suspend them in different parts of the room. Nearly every child perceived that the needles pointed in one direction, and the word north became a reality in his vocabulary. The teacher next took a small compass and told them of how Columbus used the knowledge they had gained by their needles to guide him in his voyage across the ocean when he discovered America.

It is needless to say there were ten interested pupils in that class, and when they were allowed to take the apparatus they had made home and asked to locate the north from their own yard their cup of joy was more than filled. Science, yes, but nature-study emphatically of the true kind. Better that one lesson than a dozen of the pouring-in kind. The effect of catching the interest of that class lasted during the term and insured the teacher's success with a class which before that had proven rather refractory. One boy discovered that his needle would pick up bits of iron and steel, another that he could magnetize a second needle from his own needle. A third boy saw a surveyor laying down the line for a granolithic pavement about his home and recognized the needle in the transit. A fourth saw a lumberman who wore a small compass suspended to his watch fob. A fifth was interested in the gun-metal case worn by an electrician to protect his watch from the magnetism of the dynamos. So the wide-awake young Americans came in touch with much valuable information about things magnetic and electrical as well as the geographical lesson which was primarily intended.

Take a Florence flask with rubber cork through which passes a glass tube half-way to the bottom. Heat a teaspoonful of ammonia water in the flask and connect the glass tube with a pail of water by means of rubber tubing, when as if by magic in the eyes of the children, the water runs from the pail up into the bottle as high as they can hold it and plays in a fountain until the bottle is nearly filled. The idea of a vacuum and the principle of "suction" will suggest to the active minds the pump-siphon, sipping of soda-water through a straw, and many of the interesting facts of pneumatics and hydrostatics.

Chemistry abounds with experiments many of which are entirely free from danger and intensely interesting to children. For example: A solution of sugar made by the children, a thread suspended in it and the watching of the growth of the crystals of rock candy; the same experiment performed with alum or blue-stone. A doll dressed with clothes dipped in cobalt solution, serves as a hygrometer—pink before a storm, blue in dry weather —and will make the children observant of other weather signs more related to their every-day life.

The chemical tablets which will enable the child to grow plants in the most unique positions—suspended by a cord in mid-air, in

a sponge or luffa gourd, in a glass of sand or coal, cannot but be helpful aids to the school-garden work and work in elementary agriculture so often combined with nature-study work.

I feel very strongly that much of the most valuable material for nature-study lies in the realm of physical science, and that physics and chemistry abound in subject-matter which is often much more available and at smaller cost than the materials so frequently called for along the line of botany and zoology which have filled the nature-study manuals.

My point is that the true nature-study idea is for the teacher to use in the fullest way all science so long as the experiments and apparatus will awaken the interest of the child in the world around him. I believe that the science curriculum in the normal schools embracing as it does botany, zoology, geology, chemistry and physics, for the most part taught from the view of interest, will solve in the next decade the relation of nature-study to natural science. The trained teachers who graduate each year from these schools will go to the elementary schools prepared to do original work in the nature-study period and will not be tied down to the absurdities too often found in nature-study outlines, supplied to the schools by enterprising publishers.

I have been astonished at the reaction against science, as it has been taught in our elementary and high schools for a term of years, as is shown by the new crop of text-books in chemistry, physics, botany and zoology. Subject-matter, illustrations, press-work and binding all appeal to nature-study methods of interest.

Now I confess that, personally, it went against the grain for me to accept the fact that my strictly scientific training, my technical physics, chemistry and botany would have to be somewhat discounted in my classroom if I wished to do what was really best for my pupils; but I am now thoroughly converted to the idea that if I get my pupils interested in these subjects in the spirit of nature-study they will teach much better in the elementary schools than if I harass them with the—to most pupils—absolutely detestable laws of physics, chemical formulas and botanical definitions. There is so much in these subjects of intense interest that I do not think it right to make too much of the principles which, though of great value to the professional physicist, chemist and botanist, have no real value to the average teacher or pupil.

Not that I advocate following the lines of least resistance in education, but I want, in this paper, to enter protest against the mass of science contained in the average text-book intended for use in secondary and high schools. I believe them to be beyond the comprehension and capacity of the pupils who use them in the time given to these subjects in an over-crowded curriculum.

In conclusion, fellow teachers, let me appeal to you to use whatever in physics, chemistry or other sciences will attract the interest of the children and make them love nature, and to discard all that part of science which, though of value to the few especially engaged in technical or theoretical work, is distasteful to and beyond the ken of the majority of the pupils. Remember that only that is of vital interest to the child which comes into the sphere of his experience, and is in reality part of his environment. Too often "we study nature from books and when we go where she is we cannot find her," but brighter days are dawning and much depends upon you, enthusiastic teachers, to solve this problem. The measure of your success will be the number of pupils you can inoculate with a love for nature, which will often lead to a real love for science, but there must be this sequence, nature-study winning the attention of the children in the lower grades, homeopathic doses of science in increasing quantities until the nature-study of the elementary schools blends into science in the last years of the high school. I want, in closing, to second the protest of Professor J. V. Crone, "against that effort made in response to an awakened interest in nature in our public schools to lay the foundations of science there under the name and at the expense of nature-study. True nature-study must say to science, 'Thy ways are not my ways, nor my thoughts thy thoughts.' Science is for the few; nature-study for all. They have nothing in common. They should not conflict, but let them not be confused."

SOME TEXT-BOOKS FOR SECONDARY-SCHOOL AGRICULTURE

BY C. H. ROBISON

Fellow in Teachers College, Columbia University

A few years ago a demand arose in many schools for certain instruction, which for convenience we now call "elementary agriculture." In many other quarters a demand arose for "agriculture" without anyone having a very clear notion of what the word meant. Out of the confusion has come two types of text-books representing two widely different viewpoints, with a comparatively recent attempt to produce something combining the good features of each. In one of these types of books abstract principles claim most attention; the other is purely informational or encyclopedic.

A majority of the books are intended for the elementary schools, since it seems to have been thought that the typically rural schools, must be altogether elementary ones. The "common schools" are the ones that stood in the eyes of lawmakers who have endeavored to settle the question for the education of the rural population. But two facts not heretofore given much recognition are coming into prominence: One is that in an intelligent farming community a large clientage helps to support the village high schools, whose courses have very little, outside of a little English, some history, and a small amount of "review arithmetic," to offer which is at all suited to the community's needs. Another fact, strangely overlooked, is that we cannot successfully modify a curriculum, even by legislative enactment, by the cart-before-the-horse method of pushing a new study into the course, until the teachers have been prepared to handle it. Public opinion need not be considered here, as it is much ahead of the teachers' preparation, in the teaching of agriculture at least. That legislation is wise which recognizes itself as representing a public opinion in advance of the teachers' preparation, and which provides adequate means for affording the teachers the necessary relief.

A recognition of this state of affairs has given us the three books more suitable than the others for high and normal schools, which are the particular subjects of this review.

Professor L. H. Bailey, was the first prominent exponent of the study of agriculture below the college, and the foremost exponent of one type of elementary agriculture in particular. His formulation of his own ideal has been more precise than has been that of any one else; and his book ("Principles of Agriculture") is a consistent embodiment of that ideal.

His preface is the best possible exposition of his conception of the question; and one could do little better, if time permitted, than to quote it in its entirety. In starting he says: "The greatest difficulty in teaching agriculture is to tell what agriculture is. To the scientist, agriculture has been largely an application of the teachings of chemistry; to the stockman, it is chiefly the raising of animals; to the horticulturist, it may be fruit growing, flower growing, or nursery business; and everyone, since the establishment of the agricultural colleges and experiment stations, is certain that it is a science. The fact is, however, that agriculture is pursued primarily for the gaining of a livelihood, not for the extension of knowledge: It is, therefore, a business, not a science." He emphasizes the fact that in farming "business method is the master, and the teachings of science are the helpmates," though teacher and farmer are apt not to distinguish "between the fundamental and the incidental applications of science, or between principles and facts." They are apt to forget to teach "how to overcome mere obstacles before explaining why the obstacles are obstacles." "How to kill weeds is a mere incident; the great fact is that good farmers are not troubled with weeds. Rather than to know kinds of weeds, the farmer should know how to manage his land. How to know weeds and how to kill them is what he calls practical knowledge, but standing alone, it is really the most unpractical kind of knowledge, for it does not tell him how to prevent their recurrence year after year. The learner is apt to begin at the wrong end of his problem." "The farmer too often wants to sew on the buttons before he cuts the cloth." The purpose of agricultural education, according to Professor Bailey, "is to improve the farmer, not the farm." The view often taken is that it is the function of the rural schools to teach the trade. However right and proper it is to establish special schools in counties, or congressional districts, as is being done to teach farming, I think Professor Bailey is right in combatting this idea as applied to the public schools where all must go, with little regard to the age or experience of the pupil. To quote again from his preface: "Business cannot be taught from a book like this, but some of the laws of science as applied to farm management can be taught, and it is convenient to speak of those as the principles of agriculture." The author would seem to imply here that he conceives of the student's problem to be one of understanding in a purely intellectual way, and not by doing. His treatment of the subject seems to corroborate this impression, as all of the illustrative material is evidently for demonstration alone. He says "a book like this should be used only by persons who know how to observe. The starting point in the teaching of agriculture is nature-study." The book breaks down at this very point. It teaches prin-

ciples and provides little opportunity for their application. It is much better for one with a large apperceptive mass—that is, for the farmer rather than for the farmer's child, and for one who wishes to organize on a scientific basis knowledge he already has and who wishes to provide scientific hooks upon which to hang new knowledge where it will be handy. The fault, I should say, is not so much with the book, which is admirable in many ways, as in the uses to which it has been put. It has been made a substitute for nature-study against the advice of its editor. It has been literally thrown at children who did not "know how to observe." It has been used in a wild attempt to improve at once the farmer's child and the farm, but not the farmer for whom it was primarily written. These errors are largely excusable on the ground that for a long time no other material was available, and it had to function as a "dual purpose" book, to borrow a stockman's phrase.

The following characteristics are mentioned for sake of comparison with those of the two newer books noticed later. The book is well balanced and shows little unevenness of treatment. The entire contribution of chemistry to the topic of soil is more difficult than the rest of the book, but shows little internal inconsistency. In class work the book lends itself too easily to a dead memory method. Where agriculture has been made mandatory, that is the way the book has been often taught, even down in the eighth grade, and with little use of the illustrative material furnished in the chapter notes. This, by the way, is partly of the nature-study type that is considered to be the prerequisite.

Some of the purely elementary texts go to the opposite extreme. Their tables of contents are scarcely more than lists of crops and breeds. Such a "Ready Reference for Little Farmers," stuffed with facts but completely devoid of thought content, is as well calculated to starve the mental life of the child as the shorter catechism.

Jackson and Daugherty's "Agriculture through Laboratory and School-Garden" is fundamentally different from Bailey's "Principles" in many respects. (1) It provides for much doing; it calls for much practice of the principles enunciated and for use of the knowledge given, and also for considerable inductive work. On the other hand, the spirit of the text of "Principles of Agriculture," by Bailey, is purely deductive. (2) much more of the spirit of the high-school sciences as such is evident. The first two chapters are a condensed physical geography, dealing with solar energy, the ocean, and with all the weathering agents, even to the glaciers. This forms the setting for the next two chapters dealing with soil and its relation to the plant. Similarly Chapters IX, X, and XI make up a concentrated com-

pend, or possibly I should say, a superficial bird's-eye-view of botany as far as concerns seed plants, and very properly is largely given up (over half of the 90 pages) to the practical application of botanical principles to farm and horticultural practice.

There is so much here that is built upon the old time-recognized principles of the science treated in standard text-books that one wonders that the writers of these have failed to realize the social possibilities of their subject. But so long as books are written by the average college professors or for pupils in large cities with little of the facilities for actual practice that a village affords, so long must we expect the books and teachers to direct that work be done within the four walls of a building. This brings us to the third point (3) that this book rather differs from the other book cited in that it has a method of treatment, or classification of data and principles, that does not cause one to forget that this thing we call scientific agriculture has, after all, drawn from many other sciences. This treatment at once brings out clearly how very differently the same subject-matter may be handled when viewed as agriculture, and when studied as botany, or any other science. A somewhat detailed study of Chapters IX, X, and XI, will illustrate this.

Chapter IX, "Propagation of Plants," deals with: (1) Seed planting, testing, vitality, harvesting, and preservation,—what might be called applied plant economics. (2) Seed germination,—pure plant physiology, as commonly understood. (3) Variation, treating of food supply and climatic environment,—two phases of what commonly comes under plant ecology; sexual reproduction, which would seem to imply a treatment of plant structure which is absent; and a somewhat philosophical treatment of fixation of variations by selection. The above three topics are grouped in a division "Propagation from Seeds." (4) "Propagation from Buds," ranking as one of the two main divisions of the chapter, has less of the structural treatment than we might expect; it has a great deal that is treated in good secondary botanies as physiological work, but it makes the social application which few of them do. Were the structural treatment strengthened a little, the combination would be very good; but as it stands the advance in broad conception of what botany may do is a good one.

In Chapter X, "Improvement of Plants," we have some more work on seeds that writers of standard text-books of botany would probably say should have come with the first part of the previous chapter. This work is still of a functional sort, namely selection, which seems to me to give insufficient fact basis. Later in the chapter, we have a further treatment of the subject of varieties, the originating of new ones that is a continuation of one phase of the preceding chapter. This goes into cross fertilization, which

involves a more complete study of the flower structure for a mastery of the idea than the book provides for. Work of this sort needs definite help from the text, and can hardly be given satisfactorily as supplementary work.

Chapter XI, "Pruning of Plants" sounds more like nursery business than it is, for the first part of the chapter is rich in theory and purpose, from an educative point of view. It also has some structural treatment of the stem that might, with advantage, have been more organically united with part of Chapter IX than it has been. The most of this chapter is along the applied line and has considerable theory.

The purpose in giving a detailed account of these three chapters is to furnish a concrete example of a new tendency that may become a dominant one in secondary-school science. Where we would formerly have made a vertical classification into chapters dealing with the seed, its structure and physiology, with the flower and its functions, with the stem, its buds, internal structure, and manner of working, with the abstract subject o variation illustrated by Darwinian or Burbankian examples; these authors have cut the subject-matter in horizontal section, respectively, propagation of plants, improvement of plants, and care of plants.

The book shows some faults on the pedagogical side, especially relating to the organization of details: (1) A lack of balance in many places, omitting or barely mentioning some things that might seem to many to be essential, and amplifying other things that hardly seem worth while. (2) An unevenness of treatment in which difficult and easy facts are put on the same plane, or on wrong planes, so far as treatment is concerned. This often results from (3) lack of proper sequence, by which a term is sometimes made use of in a vital way, without being sufficiently discussed until a chapter or two later.

"First Book of Farming," by C. L. Goodrich, is devoted exclusively to Soil, and Soil Crops in the abstract, with little on particular kinds of crops. "The object in presenting the book to the general public is the hope that it may be of assistance to farmers, students and teachers, in their search for the fundamental truths and principles," which are presented "in the order of their importance, beginning with the most important." The last part of this extract from the preface relates to the importance from the standpoint of the agriculturist, and not from that of the scientist. While the author does not claim to have written the book for use as a text, it has so much merit, and will prove so helpful to inexperienced teachers, that it may well be considered in this connection. It is so divided that the underlying scientific facts and principles are gathered together into Part I, while the actual farming operations are deferred to Part II. Its chapter headings and arrangement of subject-matter are more conventional than is the case with Jackson and

Daugherty's book. The fact that horticulture is not noticed accounts for grafting and pruning getting less than half a page, while insects are hardly touched upon. Soil temperature, seed planting, the various operations of cultivation, and the leaf are treated more fully than in Jackson and Daugherty's book. It has excellent experiments, which, unfortunately for class use, have no marginal or topical indication of their aim or contents, being merely labelled "experiment" and not even numbered.

The experiments are evenly graded, and seem to be arranged in good sequence, and do not explain things needed in preceding chapters. For text purposes the book has another poor feature, in addition to that mentioned: The text carefully explains how to carry on the experiment, and gives the experimenter plenty to do in preparing it. But it leaves him with nothing to do in drawing his conclusions. It starts out in a perfectly inductive way, and then makes the induction for the student, in a manner that sounds like Samuel Wigglesworth's "Book of Doom," so much used by New England Puritan children, which after telling an austere anecdote of an impossible child, adds "which is to teach us." One might go through Goodrich's book, never make an experiment, and still not have twinges of conscience. For are not the results right here on the printed page before him? The book is an excellent one for a grade teacher who is unfamiliar with the subject or doubtful how to map out the work. If she is not sufficiently up-to-date to believe in allowing the pupils to contribute to the problem, she can dictate or copy the directions verbatim, and can be perfectly sure of the moral lesson to be drawn therefrom. The only trouble is that once in a great while the author does not tell just exactly what is to happen during the experiment, and therefore, the young teacher might not see, in case the experiment failed to do just what it should, how ill-fitting said moral might happen to be.

The book should not be in the hands of one you wish to inspire with an appreciation of the method of induction reasoning and verification by experimentation. It may safely be used by one who already has the enthusiasm and the wit to see an incongruity between an experiment gone wrong and the predicted result. The Goodrich book may be said, in many ways, to stand between that of Jackson and Daugherty and Bailey's "Principles."

NATURE-STUDY AND SCIENCE NOTES

Burbank's Work. Teachers everywhere will doubtless be interested in Professor De Vries's verdict in regard to Luther Burbank's work, as set forth in a highly interesting and non-technical article in the March *Century Magazine*. The author points out that much of Burbank's work is a repetition of things already satisfactorily accomplished in Europe. He deplores Burbank's lack of theoretical knowledge, and takes occasion to point out that the biological training of the future must include not merely the theoretical side but also the practical side. The scientist engaged upon the problem of heredity is able to make much better progress when he is acquainted with the methods of practical breeders. Perhaps the most interesting point developed in De Vries's discussion is that the hundreds of sports which Burbank has on his place are not, so far as the known facts show, true mutants, and for this reason De Vries learned practically nothing that would assist him in his investigations into the underlying causes of mutation. It has been stated in numerous magazine articles that Burbank could produce a mutant at will. De Vries points out that the production of new, really new, progressive or retrogressive characters is true mutation, and that these have been exceedingly rare in Burbank's work. Striking new combinations in crosses, bud-sports, and the evolution of some scarcely visible mark into one of commercial value Burbank regards as important as the characters referred to above. This shows a lack of the scientific differentiation so necessary in work which is to be of any permanent theoretical value. The Carnegie Institution is now endeavoring to supply this lack by detailing one of its experts to establish a theoretical basis for Burbank's work, especially by instituting a statistical inquiry into the history of all his most interesting hybrid races. By this means it may be possible to develop out of Burbank's rich experience something that will be of illuminating scientific value.

C. A. M.

Boys' Gardens. An organization has been formed in Hamilton, Ohio, to be known as the "Boys Agricultural Club." Hamilton is a city of about 25,000, and is distinctly a factory town. The object of the proposed organization is to cultivate vacant lots during the summer, thus providing useful occupation for many otherwise idle boys.

Cultivation of Rubber in Ceylon. Five years ago there were only 2500 acres devoted to rubber in Ceylon, and today there are 104,000 acres. The Hevea brasiliensis, which produces the well-known Para rubber, is

most extensively planted. There are great possibilities of rubber for pavements for roadways. The rubber pavement, under the archway leading to Euston Station in London was laid down in 1881 and in 1902 was found to have worn down to 5/8 inch in the thinnest places. This pavement cost less than three times as much as wood or asphalt; but the life of wood or asphalt is 4 years, while the life of the rubber is 20 years. [From the *India Rubber World.*]

J. B.

Serpents of Pennsylvania. A large pamphlet with this title has been prepared by Professor H. A. Surface, State Zoologist, and published by the Pennsylvania State Department of Agriculture. It fully treats structure, classification, life-history and economic relations of all species found in the State.

Cedar Wood for Lead Pencils. The lead pencil is one of the most common articles in everyday use, and nearly 320,000,000 pencils are manufactured in this country every year. To manufacture these millions of pencils there are required 110,000 tons, or 7,300,000 cubic feet, of wood, so that each day in the year 300 tons, or 20,000 cubic feet, of wood are used for pencils. Since practically all of the wood is red cedar, and since the pencil industry is steadily growing, the supply of red cedar is greatly depleted; yet no substitute has been found for it. Leaving out of consideration the imported pencils, the average educated American over 10 years of age uses six pencils of home manufacture each year. Ten years ago he used less than five.

Red cedar has a soft, straight grain, and when grown under best conditions is very free from defects. Because of its peculiar qualities no equally good substitute for it has ever been found, and it is doubtful if any other wood-using industry is so dependent upon a single species as the pencil industry is dependent upon red cedar. In fact, red cedar suitable for pencil manufacture is the only wood the price of which is always quoted by the pound.

Strange as it may seem, no steps have heretofore been taken to provide for a future supply of red cedar. This has been largely due to a lack of information on the rate of growth and the habits of the tree, and to the widespread belief that second-growth red cedar never reaches merchantable size.

In accordance with its policy toward the conservation and economic use of commercial woods, the Forest Service has made a careful study of red cedar and has come to the conclusion that it can profitably be grown in regions of its development. Several changes are recommended in present forest management in order to secure the desired growth. In the southern

forests the cedar will have to be given a better chance instead of being considered, as now, a negligible quantity in its younger stages, and many of the forest-grown trees which are now cut for fence posts can profitably be left to attain their full development and thus become available for pencil wood. [*Press Bulletin, Forest Service.*]

Changing Names of Animals. With reference to the tendency to substitute older for well-known scientific names of certain plants and animals, Professor Kingsley, of Tuft's College, writes in *Science* the following interesting sentences: "Names of animals and plants are but means for easy reference; nomenclature is not the end and object of all biological science. * * * The safest plan for the morphologist or the ecologist is to stick to the well-accepted, time-honored names and to utterly ignore the vagaries of the nominalist."

Timber Supply. Every person in the United States is using over six times as much wood as he would use if he were in Europe. The country as a whole consumes every year between three and four times more wood than all of the forests of the United States grow in the meantime. The average acre of forest lays up a store of only 10 cubic feet annually, whereas it ought to be laying up at least 30 cubic feet in order to furnish the products taken out of it. Since 1880 more than 700 billion feet of timber have been cut for lumber alone These are some of the remarkable statements made in Circular 97 of the Forest Service. A study of the circular must lead directly to the conclusion that the rate at which forests products in the United States have been and are being consumed is far too lavish, and that only one result can follow unless steps are promptly taken to prevent waste in use and to increase the growth rate of every acre of forest in the United States. This result is a timber famine.

Destruction of Deer by Wolves. Timber wolves have become so numerous and destructive to game in the Upper Peninsula of Michigan and in extreme northern Wisconsin and Minnesota as to threaten to exterminate the deer. Deer are found in considerable numbers in the swamps and dense timber, where, during the time of deep snow, they had gathered into well-beaten yards, often a hundred or more in a yard. Within the yards and along the trails food was abundant, and the deer would have wintered in good condition if unmolested, but while the snow was soft they were entirely at the mercy of the wolves.—[*Dept. Agr. Circular.*]

Danger in Cattle from India. An importation of zebu or Brahman cattle from India made last year showed that there is danger of the disease

known as surra being introduced by animals from that country, and that these cattle are apparently immune to Texas fever and to the attacks of the cattle ticks of the United States. They have been exposed to the ticks carrying the infection of Texas fever, and not only have they failed to contract the disease, but the ticks do not seem to develop upon them. When exposed on the same pasture with American cattle which are heavily infested with ticks, they remain practically free from these parasites. It remains to be seen whether they will continue to withstand infestation during the warm season. In view of the danger from surra, the Department of Agriculture is unwilling to allow further importations from India. Surra is caused by a micro-organism scientifically termed Trypanosoma and is a very fatal disease of horses, mules, dogs, and certain other animals, while in animals of the bovine species it is relatively a mild affection Cattle may carry the infective agent in their blood without showing any marked evidence of disease, and herein lies the great danger, as apparently healthy cattle from India might be the means of introducing a disease highly destructive to horses and mules. Flies may carry the contagion from an infected to a healthy animal ; hence the cattle in the importation above mentioned were confined in separate box stalls and carefully screened while in quarantine.

NEWS NOTES

[EDITOR'S NOTE.—Again the Editor must request the cooperation of readers for this department. News concerning nature-study and especially concerning persons and institutions interested in nature-study in all its phases will certainly interest many readers. This department would be a regular feature if information for news notes could be obtained by THE REVIEW.]

The above editor's note was called forth by a letter of recent date which contained an incidental reference to the death of **Professor Buel P. Colton,** of the Illinois State Normal University, author of the well known text-books of elementary physiology and high-school zoology. A letter of inquiry has brought the information that Professor Colton's death occurred nearly a year ago.

Professor Otis W. Caldwell has resigned from the normal school at Charleston, Ill. to accept an appointment in the Department of Botany and School of Education in the University of Chicago. He will have general charge of the nature-study work.

Courses for Teachers of Agriculture. An arrangement has just been completed between the College of Agriculture of Cornell University and the Department of Biology of Teachers College, Columbia University, for

cooperation in the work of preparing teachers for nature-study and elementary agriculture. The Teachers College Annual Announcement calls attention to a two-year major (Junior and Senior years) in nature-study and agriculture, leading to the Bachelor's degree and a special diploma. The program of studies requires courses in the elements of the sciences, in general elementary methods, in the special methods of nature-study and elementary agriculture, and the equivalent of at least two summer terms devoted to the study of principles of agriculture at Cornell University or approved courses elsewhere. Under this arrangement a student might spend one year at Cornell studying principles of agriculture and the sciences and the second year at Teachers College devoted chiefly to educational problems. More details concerning the plan will be announced in a special circular soon to be issued by the Department of Biology of Teachers College, New York.

Miss Mary Perle Anderson, graduate student in the Department of Botany, Columbia University, has been appointed instructor in biology and nature-study in the Horace Mann School of Teachers College, Columbia University. Miss Anderson will also take charge of the critic teaching in connection with the Teachers College courses in high-school biology and elementary-school nature-study.

Professor E. R. Downing, of the Marquette, Mich., normal school will spend a year of absence in eastern universities and in Europe.

New nature-study books are being prepared for publication by Professor Holtz, of the Mankato, Minn., normal school; by Mr. G. H. Trafton, of the Passaic, N. J., schools; and by Dr. Horace Cummings, of Salt Lake City.

An imposter has for several months been working among nature-study teachers in New York and New Jersey. His specialty is paid-in-advance subscriptions to a magazine "Birds and all Nature," including sixty colored plates. Evidently he is trading on the good reputation of the well-known Chicago magazine, but he pretends to represent the "Nature-Study Company, 1135 Broadway, N. Y."—a firm unknown to postoffice officials and not found in any directory. Many letters of complaint have reached the office of THE REVIEW, and they all tell essentially the same story: The agent signs his name F. W. Cooley, is a Quaker, about 70 years old, gray hair, blue eyes, slender form, not well dressed (probably he can afford better clothing now), and minus two fingers on his right hand. Even an amateur Sherlock Holmes should be able to identify him at sight after reading this description.

RECENT (1905–1906) BOOKS IN NATURE-STUDY AND SCIENCE

Log of the Sun. By C. W. Beebe. A chronicle of nature's year. 52 full page plates, numerous text figures. New York: **Holt & Co.** 1906. $6.00.

Darwinism and the Problems of Life. By Conrad Guenther, translated by Joseph McCabe from third German edition. A study of familiar animals from evolution viewpoint. Pp. 436. New York: **Dutton & Co.** 1906. $3.50.

Real Things in Nature. By E. S. Holden. A reading book of science. Pp. 443, 408 figs. New York: **Macmillan Co.** 1902, reprint 1906. 65 cents, school edition, 50 cents.

Familiar Wild Animals. By S. A. Lottridge. A reader for children. Pp. 115, photographs. New York: **Holt & Co.** 1906. 60 cents.

Bird World. By Stickney and Ralph Hoffman. A reader for children. Boston: **Ginn & Co.** 1906. 60 cents.

How Ferns Grow. By Margaret Slosson. A study of the development of form and variation of fern leaves. Pp. 156, 46 plates. New York: **Holt & Co.** 1906. $3.00

Good Health. By Frances Gulick Jewett. The first of a series of five books on hygiene for elementary schools. Pp. 172, illustrated. Boston: **Ginn & Co.** 1906. 60 cents.

Renewal of Life. By Margaret W. Morley. How and when to tell the story to the young. Pp. 200, illustrated. Chicago: **McClurg & Co.** 1906. $1.25.

Agriculture Through Laboratory and School-Garden. By C. R. Jackson and Mrs. L. S. Daugherty. A text-book of elementary agriculture. Pp. 403, 150 figs. New York: **Orange Judd Co.** 1905. $1.50.

Biology of the Frog. By S. J. Holmes. A text book for colleges. Pp. 370, 94 figs. New York: **Macmillan Co.** 1905. $1.60.

How to Know Wild Fruits. By Maude S. Peterson. A guide to trees and shrubs. Pp. 340, illustrated. New York: **Macmillan Co.** 1905. $1.50.

Practical Physiography. By H. W. Fairbanks. A text-book for the high school. Pp. 542, 403 figs. Boston: **Allyn & Bacon.** 1906. $1.60.

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THE
NATURE-STUDY REVIEW

DEVOTED TO ALL PHASES OF NATURE-STUDY IN SCHOOLS

VOL. 3 OCTOBER, 1907 NO. 7

THE NATURE-STUDY COURSE

ELLIOT ROWLAND DOWNING, Ph.D.
Northern State Normal School, Marquette (Mich.)

"On the whole the existence of these Olympians" the (grown-ups) "seemed to be entirely devoid of interests. To anything but appearances they were blind. For them the orchard (a place elf haunted, wonderful!) simply produced so many apples and cherries: or it didn't—when the failures of Nature were not infrequently ascribed to us. They never set foot within fir wood or hazel copse, nor dreamt of the marvels hid therein. The mysterious sources, sources as of old Nile, that fed the duck-pond had no magic for them. It was perennial matter for amazement how these Olympians would talk over our heads—during meals, for instance—of this or the other social inanity, under the delusion that these pale phantasms of reality were among the importances of life. We illuminati, eating silently, our heads full of plans and conspiracies, could have told them what real life was. We had just left it outside and were all on fire to get back to it. Of course we didn't waste the revelation on them; the futility of imparting our ideas had long been demonstrated."—From The Golden Age, by Kenneth Graham. Chap. I. The Olympians.

If the conclusions of the preceding article are measurably correct, it follows that nature-study has some very definite and very important aims. The course of study must needs be adapted to their attainment in a precise manner. The haphazard use of whatever material comes most easily to hand is to be deplored quite as much in nature-study as it would be in any other department. There is such a wealth of material that may be utilized, it is evident we must elaborate certain principles of selection and arrangement of subject-matter. This may be accomplished if we bear in mind our purposes.

It would seem, at first thought, that we might accomplish the desired training in observation on almost any group of natural objects, with equal facility, but the intensity of sensory impressions is conditioned largely by attention, and this, in turn, is determined primarily by interest. We may safely state our first principle of selection then; *utilize such material only as appeals to the interest of the child.* This is a principle which will admit nearly, if not quite, the entire universe to the curriculum; since

the interests of the child are so constantly changing with advancing years. Yet it is a principle which will at least help materially in arranging the sequence of subject-matter. Thus animate objects are of greater interest than inanimate to the young child. His pets and the plants he can rear are delightfully attractive. Early childhood is the reappearance of the racial age of mythology. The stars and the meterological phenomena about him appeal strongly to him when presented in connection with the myths they have generated. At adolescence the child becomes more utilitarian. Things begin to assume commercial values. Then the chemistry and physics of common objects and processes, the forces that man utilizes, acquire dominant interest. These suggestions will serve to make apparent that a comprehension of the fundamental ideas of genetic psychology is essential to the formulation of a successful course in nature-study. Otherwise, the teacher will miss the high tide of interest and will ever be attempting to force upon the child, subjects which though they appeal to her, may be utterly foreign to the child's world. The child's interests are fortunately exceedingly cosmopolitan, not at any one phase of development, but taking childhood as a whole. There should be a corresponding range in the subject-matter of nature-study. Let the child know, familiarly, the common stars, the constellations and the fables they suggest; let him name the animals and plants about him and know their habits as he sees them. Teach him the common minerals and rocks of his native place, something of the chemistry and physics of the every-day life. Let him follow the brook and roam the hills with open eyes. This do and you equip him with a fund of delightsome memories to enrich his mature years. What a monotonous world this is to many whose early training dulled some senses to the simple joys that abound about them. Read Shakespeare, Scott, Longfellow, James Lane Allen, or for that matter, any writer of repute and observe how wonderfully important a part are these sensory images of childhood in the equipment of the successful author. Then realize how much of literature is necessarily a terra incognito to the child who is deficient in the corresponding imagery.

There is undoubtedly danger in the exclusive training of the power of observation in extenso, danger that attention may be dissipated by a multiplicity of interests and that, therefore, that power of concentration be lost which is so essential to valuable

achievement. Distraction of thought may easily result from obtrusive sense impressions. This danger may be eliminated however, and the training in observation be given its most valuable form if,—and here is enunciated the second principle—*we select subject-matter, in the higher grades, that readily leads itself to problem form*, thus compelling the child to observe for a purpose. This insures concentration and gives a practical turn to the training, for it is thus that we apply our sense training in every-day affairs to the solution of the difficulties that confront us.

Our second general aim was stated to be a drill in the complete thought process. It behooves us in the formulation of any new course of study to carefully inspect the old. The classical course was weakest where nature-study claims exceptional strength. Still constant attention to inflections, terminations, accents, etc., certainly made eye and ear alert in a measure, and there can be no doubt of the prime value of the classical course in intellectual and moral training, for the pedagogical skill of centuries is concentrated in this course. The ennobling thought, the holy ambitions, the high ideals, the mighty deeds of two unrivalled civilizations are encompassed in it.

The classical course has dependent continuity, increasing complexity, corresponding to the increasing capacity of the student, and a consequent unity; all of which are essential characters in any course that pretends to develop intellectual power. The first lesson in Latin consists of a few rules of grammar, a small vocabulary. The second adds more of each, built upon the foundation of the first. So each lesson, each term's work presupposes a knowledge of all that preceded. One might not think of entering a Virgil class without the preparatory work. But the average high-school and even college course in science has been and still, too often, is characterized by an entire lack of such dependent continuity. It consists of a term or two of work in physical geography, physics, chemistry, botany, physiology, zoology, geology, and perhaps a few other "ologies" that are taught as independent subjects. A pupil may enter any class without question as to his successful completion of preliminary subjects and the studies are taught so as to permit of their successful completion without demanding proficiency in the logical prerequisites. As a result science has been stigmatized as inefficient for educational purposes when the weakness lies in the man-

ner of presentation and not inherently in the subject-matter. We need to avoid such desultory work in nature-study, or be assured it will be temporarily abandoned.

Some unifying element must be introduced or the course of study becomes fragmented, resulting in a series of uncoordinate, efforts that lose their cumulative effect. In a course aiming to develop thought power this unifying factor would best be a series of logically related ideas or a dominant concept. It is only by some such unifying idea that the nature-study movement can hope to achieve uniformity. The objects to be studied are so varied, the world over, that there can be no course prescribed with identical materials. A theme, however, may be worked out uniformally and still use dissimilar objects. We must seek, then, some unifying idea in nature -study sufficiently complex to insure an increasing difficulty commensurate with the increasing power of the pupils.

Historically, scientific thought has been unified by the concept of evolution. I can find no other idea that promises to so thoroughly unify nature teaching. Not that the concept of evolution should be taught, or even suggested in the grades, but in the selection of material and of the minor problems for study, we should choose such as will store the mind of the pupil with the facts, which, in his mature years, will enable him to think clearly along the line of evolution—an idea that has come to affect vitality the whole philosophy of life and that promises large inspiration. Moreover, such a stimulating concept is rejuvenating to the teacher. It sends her afield with new interests, keen to perceive again with childish delight the old, now new, environment.

I am advocating in this no pedagogical heresy or even a new idea. For we select the matter for study in the grades in other lines in a totally analagous manner. We do not study all history. We ignore the Patagonians, the Icelanders, the Dahomies. Attention is engrossed in fact by a geographically insignificant region. We study the history of those people that have contributed directly to the evolution of modern civilization. In literature we do not read all authors. In fact we strive to eliminate from the student's consideration the great bulk of printed matter and confine his attention to those writers whose work has contributed to the development of the world's thought and the advance of the art of expression. The third principle may then

be stated, that we disregard many of the phenomena about us and *select for elementary instruction those things that have contributed directly to the evolution of the world and its life*, from the simple beginning to present complex conditions.

Some illustrations will render the meaning clearer. You are out of doors with a group of children studying a near-by brook or a water runnel after a shower. Now many things will be seen, but the teacher should endeavor to have those phenomena studied which will impress most forcibly the active part the brook is playing in the change of the earth's surface, Pupils may measure from year to year the erosion and sedimentation at some particular points, estimate the seasonably variable amount of material transported and so come to know the brook as a dynamic agent. Later this knowledge will fall into its appropriate place in the discussion of sedimentation, rock formation and earth sculpture, when the child more matured shall be thinking out the problem of the earth's development.

The spring ponds are full of creatures that interest the children and that hold them fascinated about their banks. Now the wise teacher will make sure that they see, among other things, and see repeatedly, the development of the toad or frog from its egg, that they may be impressed with the wonderful story. A tiny speck of living substance gradually transforms day by day, in the home-made aquaria, growing, elongating, assuming head, body, tail. At last it is a swimming creature. Then the tail resorbs as the legs grow and the fish like animal transforms so as to live on the land. Here is evolution. The child who has pondered such things in the individual will not be staggered by the idea of an evolution in the race.

Finally we will *select that subject-matter which will also best enable us to add the moral inspiration* voiced by the world's great writers or portrayed by the artist. In bird study, for example, one might profitably pass by many a gorgeous songster to have the class study the wild duck in her haunts to the end that the pupils may appreciate Bryant's "Ode to a Waterfowl," ending

> "He who from zone to zone
> Guides through the boundless sky thy certain flight,
> In the long way that I must tread alone
> Will guide my steps aright."

That note of faith, stored in the child's retentive memory, may serve as a fitting climax to a term's study of the birds.

DEVELOPING THE EDUCATIONAL VALUE OF SCHOOL-GARDENS

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Something has been done along the line of school-gardens in United States, but it is little when one considers the possibilities. Some of the work has "taken" and may be considered established but much that has been undertaken has fallen by the wayside. Somehow not all the people have become enthusiastic advocates of school-gardens. Until teachers know more about the work that needs to be done in a successful school-garden, and how to make it bear fruit from an educational standpoint they will be slow to undertake the work. Until patrons see some use in the school-garden they will be slow to give it their financial support. It must reach over into the home and bear fruit. As long as there is no well defined purpose to the work done, as long as it consists of many little things, often unrelated and more or less useless, it will be passed by as a fad and the school gardener will be looked upon as a fiddler of second rank. As soon as it stirs up the boy or girl to do better gardening at home and to think more about what is done, then will it be looked upon as a useful adjunct of the school and it will be well cared for by the community.

In what follows an attempt will be made to indicate some lines of work that may be done in connection with the school-garden to establish it upon a sound basis. It is taken for granted that the teacher understands that he is not "the whole thing." The children should have a large share in projecting the work. This means that the work is not to be imposed upon the children, as is often done.

Suppose for instance, that one is teaching in a farming community where grapes may be grown, but are not grown generally because of ignorance of their culture. If the teacher is able to interest her pupils in grape culture she can do them much good. Together they may work out many interesting and profitable problems. Let us see what can be done.

The teacher and pupils can investigate the extent to which grapes are grown in the territory about the school. This may be

limited to farms within a distance of three miles. If the work is well planned a considerable amount of valuable data will be gathered as to varieties, hardiness, productiveness and cultivation of the grapes found near home. We do not investigate the near-at-hand things as much as we should. We are prone to begin with books or with something that is beyond our reach. After the best that the home has to furnish upon grape culture has been gathered, pupils may learn much from the catalogs obtained from nurseries. Suggestions will be found as to suitable varieties for different sections of United States with descriptions and possibly pictures of different varieties. With these data at hand pupils and teacher should be able to make a selection of varieties that will do well. Further assistance may be gained by writing to the nearest experimental station, to the state agricultural college, or to the department of agriculture at Washington, D. C.

If it is found that nearly all of the hardy varieties are grown in the neighborhood or the territory investigated, it will not be a difficult matter to arrange to secure cuttings in the early spring when the vines are being trimmed. A cutting consists of a healthy piece of vine having three buds. If possible enough cuttings should be obtained so that each pupil may have several plants either in his school or home-garden.

He must discover how to make the cuttings grow. This will set him to reading, to asking questions, possibly to take a trip to a nursery if there is one nearby. It will be necessary to make a study of the soil to determine if it is right for grapes. If it is not right but may be made right, then pupils must find out what to do to it to improve it. Then the cultivation of grapes, how to protect them from drought or too much rain needs to be considered. As the season advances the subject of winter protection comes up as another important problem to be solved. As spring approaches one begins to think of pruning. When this should be done and how it should be done are important questions for those who make a success of raising grapes. It will be discovered that there are several different methods of pruning and that each has its merits. As the cuttings grow into vines they will need to be transplanted. When and how should this be done to secure the best result is a subject by itself. Some will be transplanted on the school ground where the best methods of cultivation and

pruning may be taught to pupils. Others will be taken home by pupils and planted and cared for by them. The various kinds of trellises may be made for the grapes in the school-garden. Insects and other injurious animals and fungi will need to be studied with a view of protecting the vineyard against harm from them. This will lead to a study of the matter of spraying grapes.

As the vines begin to bear the girls will want to learn various ways of serving fresh grapes on the table. They will want to learn how to make grape jelly, unfermented grape juice, and how to preserve them in various ways either alone or with other fruits. It may be well to know how to make wine. The matter of cold storage and other methods of extending the season of the grape makes an interesting subject of study. The boys will want to investigate ways of putting fresh grapes on the market. They will find it an interesting problem to estimate the yield per acre and the profits from the same. The profits from other fruits and farm crops should be estimated and comparisons made. This will lead to thoughtful farming and gardening.

The school vineyard might be a sort of experimental vineyard for the whole community. From time to time new varieties will be introduced and their merits discovered, if they have any. If they are a success new plants will be propagated from them and in this way better grapes will find their way into the home vineyards of the community. Something may be done along the line of raising new varieties from seeds which will introduce pupils into a field of study that has great possibilities. At this point it may be well to suggest the importance of going beyond the particular to the general. For instance, while the pruning of the grape is being considered the broader subject of pruning and the principles underlying pruning should be grasped. While studying spraying of the grape pupils should get something more that will guide them in the spraying of other plants. In the same way they should learn more than the propagation of the grape while they are planting the cuttings from the grape. It is the discovery of the general in the particular that makes our teaching worth while. This leads our pupils to grow in strength. It will tend to make them resourceful when surrounded by new conditions.

What has been said about the grape is typical of what might be said of many of our common fruits with a view of indicating how such subjects may be handled in our schools so as to enlist the

cooperation of pupils and parents. One kind of fruit calls for study along one line while another emphasizes another line. With one, for instance, it is pruning, with another it is spraying with still another, winter protection is the important problem.

The writer is aware of the fact that many will think these suggestions very theoretical but not practical when applied. They are suggested because they are practical. Two years ago the writer went with a class of boys and girls to a vineyard where enough cuttings were secured to grow about fifty good vines in our school-garden. In the spring about a dozen of these will be planted in the school-garden and cared for as suggested and the remainder will be given to pupils to plant in their home gardens. Arrangements have already been made by which we will be able to have all the cuttings we wish if we will properly trim the vines in the early spring. In this way we hope to secure at least two hundred cuttings for our school-garden. These will be from good varieties as the Concord, Worden, Moore's Early, Niagara, Delaware, and Pocklington. We have a little school-garden money on hand which may be used in part to buy a few new varieties to test their value in this climate. This work is practical, it leads somewhere, it furnishes a basis for the best of school work in that it is full of problems that are closely related to life. More than this pupils are given a chance to do things with their hands while their minds are busy. It is very much like what they will have to do when they grow up. They will have a motive in going to books if this work is handled in the right way. They will have something to think about in the home that relates to the work done in school. Parents out of their fund of experience will be able to help their children with their school work and possibly they will be stirred up to study better ways of doing things. It should make the farm a more interesting place for the farmer's boys and girls.

EXPERIMENTAL STUDY OF GERMINATION WITH A LAMP-CHIMNEY

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The experimental study of germination affords in many ways ideal nature-study lessons because, (1) the lessons may be made observational at almost every step, (2) they may be made experimental and, therefore, subject to the teacher's control, (3) much of the work can be done with inexpensive apparatus by the children, (4) the ideas presented are of the larger sort and grow with the child, (5) the applications are numerous, important and right at hand. These five points are worthy of more than a passing glance in the arranging of nature-study lessons.

In some ways I have found an ordinary five-cent Argand or student-lamp chimney peculiarly well suited for the study. The method of using it is as follows: Roll the portion of chimney above the bend in blotting paper, cut the paper off so that the edges will not meet when rolled on the outside of the chimney but when rolled so that edges meet, the paper cylinder should slip into the chimney without binding. As you push the cylinder down into the chimney insert pea, corn, morning glory, squash and oat seeds on different sides of paper cylinder between paper and chimney. Do not insert too many seeds; 12 to 20 seeds are quite enough for a chimney. It requires a little patience to insert the larger seeds, but when once placed and the paper cylinder is pushed down so as not to protrude above the top of the chimney no further trouble will be encountered. Do not wet blotting paper until after it is in place. Insert at both ends of paper cylinder wads of wet moss (sphagnum) which may be had at any greenhouse. Now for the first time thoroughly wet the blotting paper by standing the chimney on small end and fill the large end of chimney with water; shortly the water will soak through the moss and thoroughly wet the blotting paper. Perhaps no further wetting will be necessary throughout the experiment. Breaking of chimneys from tipping over can be prevented by tacking corks large enough to fit the large end of chimney to a

thin board and setting chimneys down over the corks as shown in Figure 1.

Following are a few ideas of the conditions that are concerned in the sprouting of seeds that can be taught experimentally with the chimney germinator:

Seeds must have water in order to sprout. Arrange two chimneys of seeds; thoroughly dampen the blotting paper and moss in one while the other is kept dry. Otherwise treat the chimneys alike.

Seeds kept too wet decay before, or soon after sprouting. Prepare a third chimney of seeds leaving the moss out of top. Smear a

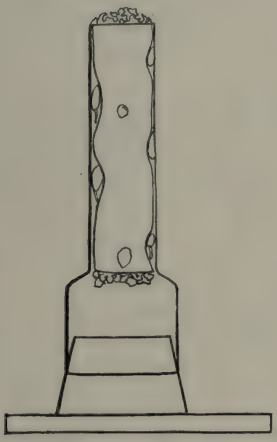

FIGURE 1.—A student-lamp chimney with a cylinder of blotting paper, seeds between paper and glass, and wet moss inside the paper cylinder. A cork at bottom is nailed to a board for support.

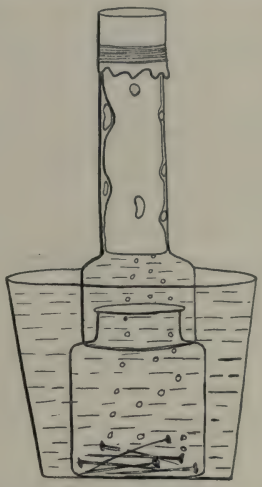

FIGURE 2.—Chimney arranged first as in Fig. 1, then closed by tying rubber sheeting at top, filled with water and finally water displaced by hydrogen generated in the bottle containing iron nails and sulphuric acid. To demonstrate that seeds require air for germination.

cork large enough to fit bottom of chimney with vaseline or drippings of burning candle; fit cork into chimney so as to be water tight and fill the chimney to the top with water; keep the chimney filled until it is evident the seeds will not grow.

Applications of these lessons. Seeds are kept in dry places until they are wanted for planting. At times certain seeds as corn, for instance, are soaked for a few hours before planting that the seeds will sprout more promptly when placed in the ground. After preparing beds for seeds the ground is sometimes sprinkled before or after planting the seeds. Some grass

seeds for instance, is almost never sown except during or after a rain. A common practice is to cover beds in which seeds are sown on the surface, or but slightly covered, with brush. The brush shade the ground from the heat of the sun thereby keeping the soil moist for the seeds.

On the other hand, many seeds mould and are ruined by getting too wet. Before planting seeds in the early spring, it is customary to wait for the sun to dry the excessive dampness out of the ground; otherwise the seeds might decay before sprouting. Plowing and spading greatly hasten the drying out of excessively wet soil. Some land is naturally so wet that it has to be drained by means of ditches and tiles before cultivated plants will grow in it. Portions of some fields are so depressed that when a hard rain follows planting water collects in the depressions and prevent the seeds from sprouting.

Seeds require heat of a certain degree in order to sprout quickly. Prepare two chimneys of seeds alike in all particulars with the exceptions that one is placed where it is warm while the other is placed in the coldest place you can find. It is very easy to confuse light and heat in this experiment. A dark corner may be the warmest place in the schoolroom; in order to make no mistake, place one of the chimneys out of doors in a shaded spot, or take the temperature of different parts of the building and select a spot that is decidedly cooler than the place chosen for the other chimney.

Light is unnecessary and even retards sprouting. Prepare two chimneys of seeds, treat alike except about one chimney wrap a number of thicknesses of dark colored paper gumming the outer edge to hold it in place. When paste is dry you should be able to slip the paper cylinder up and down in order to examine the progress in sprouting made by the seeds.

Applications of these lessons. The temperature of the soil is quite as important a factor to consider in planting of seeds as the presence of moisture. For this reason seeds are not placed in the soil until the spring sun has warmed the earth considerably. The turning up of the soil in the processes of plowing, spading and harrowing very materially quicken the warming of the soil. Seeds of cabbages, tomatoes, etc., are commonly started in the house and cold frames that they may get more heat than is supplied by the ground at that time of the year. Horse manure is

sometimes bedded in cold frames to furnish artificial heat to the soil containing seeds which is placed on the manure. The manure undergoes a fermenting process during which a remarkably large quantity of heat is given off. As every one knows, certain spots protected by buildings, or on the south side of walls and hedges are chosen for early vegetables. For a similar reason plots on the south side of hills are chosen. Crops in valleys are usually many days earlier than the corresponding crop on the neighboring hill. Even though the seeds are planted on the same day, the extra amount of heat of the valley produces quicker sprouting and subsequent growth.

Although light is necessary for proper growth later, it clearly has a retarding effect on sprouting. Very little attention is given to the matter for the reason that in the planting of seeds light is incidentally shut away.

Seeds will not sprout without air. Arrange another chimney with seeds and blotting paper and then close the top in the following manner: Secure from a dentist enough rubber sheeting (rubber dam) to go over the top of the chimney twice. Halve the rubber, put mucilage around the top of the chimney and tie one of the pieces of rubber over the top, winding twine many times around to secure an air-tight joint. In order not to fail in this matter, tie the other piece of rubber sheeting down over the first tying it lower on the chimney, thus covering the first tying. If you are painstaking in the matter, the joint will not only not leak water, but air will not pass through it. It is practically impossible to secure an air-tight joint with an ordinary cork, otherwise it could be used in place of the rubber dam. As soon as the mucilage is dry, invert the chimney and fill with water, then displace the water with hydrogen gas. If a chemical laboratory is convenient you can secure apparatus for generating hydrogen with little trouble. If you are not so situated, the following arrangement will answer very well. Into a small wide-mouthed bottle (2- or 3-ounce) drop a number of ordinary nails, add water and to this add not over an ounce of sulphuric acid. Bubbles of hydrogen gas will almost immediately begin to rise. *Keep all flames away from the escaping hydrogen.* Lower the bottle into a dish of water deep enough to cover the bottle an inch or so. Now place a card over the bottom of the inverted chimney of water and lower the chimney over the bottle from

which the hydrogen is escaping, removing the card as soon as the bottom of the chimney is below the surface of water. While in this position the hydrogen will rise and displace the water in the chimney. See Figure 2. When the water has been displaced, place the card under the bottom of chimney so that air cannot enter and mix with the hydrogen, and transfer the chimney to a shallow dish of water. Place beside the chimney another chimney of seeds arranged with moss as in previous experiments. The seeds will not sprout in the hydrogen if you succeed in excluding air.

Application of this lesson. It is not commonly realized that seeds require air as well as water and heat to sprout, yet such is the truth taught by this experiment. The hydrogen has no effect on the seeds, but is used as a means of keeping the air from them without which they cannot sprout. It is known that the oxygen of the air enters the soaked seeds and starts the processes of growth. Perhaps on the whole it is not wise to enter into a discussion of the part played by oxygen in the sprouting of seeds; for aside from the technical nature of the question, there is considerable uncertainty about certain steps of the process. The fact that air is absolutely necessary for seed sprouting is so simple a truth and at the same time so important for one to appreciate who raises plants that it is well worth the trouble of presenting as a lesson. It is not probable that seeds often fail to sprout for lack of air, for ordinary soil is well supplied with a "soil atmosphere;" besides the processes by which the soil is prepared for planting introduces large quantities of new air into the soil. When the soil is soggy, or covered by pools of water, air may be excluded sufficiently to prevent sprouting.

Sprouting seeds are influenced by gravity. Prepare two chimneys as described in the first experiments. As soon as the seeds begin to sprout see if you can cause the caulicle to grow up and the plumule down by putting one of the chimneys in different positions. The undisturbed chimney acts as a control with which you can compare the growth of the plantlets in the disturbed chimney.

Application of this lesson. Our inability to confuse the caulicle and plumule in direction of growth is regarded as one of the most difficult activities of plant life to understand. The caulicle whose function is to secure food from the soil persists in growing

in the direction where soil usually is found, while the plumule whose function is to spread leaves to sunlight persists equally well in growing upward, or in the direction in which sunlight is usually met. It has been customary to say gravity causes the caulicle to grow downward, but why the pull of gravity should not influence the plumule in a like way is beyond our understanding. Whatever the true explanation of the contra movements of caulicle and plumule, the fact that they persist in growing in opposite directions is something to cause every one to marvel at the adaptations these parts display for the good of the plant. Notwithstanding stones and hardness of soil, caulicles are found working their way with marked success into regions of food, overcoming difficulties in the shape of obstructions and distances through which they must grow that never fail to surprise the observer. Likewise the plumule while in a compact form forces its way between hard masses of soil and around stones on its way to air and sunshine above. Were not caulicle and plumule able to respond to the stimuli that gives them the directions in which to grow, and were they less persistant in pushing forward on their journey to soil and sunshine, the sprouting of seeds would present difficulties that would very much modify present practices.

THE QUESTION OF COMMON NAMES

The labelling of the shell collections brings up once more the oft asked question "why doesn't every specimen have a common name?" An easy answer to this is that there are not enough common names to go around and while over 350,000 animals, great and small, have already been described and the list is steadily growing, our largest dictionaries contain only about 300,000 words. Another reason is that the great majority of animals are not commonly known and never have received and never will receive any common names. Insects and shells are familiar examples of the case in point, to say nothing of the vast host of minute organisms that the public never sees, but each one of which must be named. A great many so-called common names, too, have no meaning to people outside of the countries where the animals to which they are applied are found and it is not probable that many readers of this are familiar with Colugo, Wobbygong, Mullagong, Scheltopusic, Cacomistl, Aye Aye, Kagu, Awa, Kea and Kakapo. And yet each one of these is an extensively used "popular" name.

It may be objected that these are all names borrowed from people who do not speak the English language but many strictly English names are just as incomprehensible to us. The chaffinch, for example, is variously called pink, spink and twink (these three names referring to its note), beechfinch, horsefinch, shell apple, skelly, scobby, and shifla. And how many here even know a chaffinch? The truth is no name means anything to us unless we know the creature to which it is applied, or at least something about it, and so can associate the name with the object. Not until then does it have much value as a "common" name. The robin is found throughout the length and breadth of the United States and everyone thinks he knows "a robin." But the original robin of England, the robin-redbreast of a thousand and one stories, is very different from his North American namesake and related to our redstart, while in Jamaica the name is given to a little tody, one of a group of birds peculiar to Tropical America. In India the robin is a warbler, in Austral a a flycatcher, or a little Petroeca and the South African "robin" is a coly, a bird about as much like its English namesake as is a parrot. Here surely is a case where a common name means nothing more than a bird with an olive brown back and a reddish breast, that may belong to any one of seven different families, which is very much as if every red-haired boy should be called Redman, in spite of his parents being named Brown, Black or White. [*Museum News*, Brooklyn]

BOOK REVIEWS

School Gardening for Little Children. By Lucy R. Latter. London: Swan Sonnenschein & Co., 1906.

[EDITORIAL NOTE —A review of this book was published in the April issue, but the manuscript of the following was received a few days too late for publication in April. It strikes the editor as a useful and accurate criticism supplementing the review already published. The desirability of book reviews by more than one writer has often been suggested; and the managing editor takes this opportunity to invite readers to send their own supplementary or critical notes on any reviews published in this journal.]

This book on school-gardening for little children has many good points, but in general it is not a safe guide for nature-study as we would see it taught in America. The best points are (1) that the children do actually work with the objects under consideration and also do the related manual work, which we are not always careful to include in our nature-study work in this country; and (2) that not only the life-history of every plant studied is definitely shown, but the fruits of one year are used in the next season's planting.

While in New York last winter Miss Latter described her work, giving several facts which materially affect the estimation of value of the lessons described in her book. The ages of the children range from four to eight years; less than six pupils from each class-room have any part in the out-door garden work; and the same work is done in the different grades but "taken up from different standpoints." Spending weekly the amount of time indicated on page 18 (three hours or three hours and forty-five minutes) it would puzzle a high-school or college instructor to spend a month upon either the earthworm or the radish with "additional work in August and September." Add to this the problem of a different point of view for each of the grades and the despair of the most capable instructor would be complete. The topics suggested under the subject, the sun, are more varied, but it would be difficult to hold an American child to three months' work on even the fifteen topics given. The English children apparently study the caterpillar for seven days (or lessons) before the shape and color are thought of; the *fourth* lesson on the daffodil brings out the color and shape of the flower; the fifth tells the children where the "seed-box" is; but they are not allowed to prove this, even though it is the first flower studied by many of the children, because (page 61) "no child is ever allowed to pull a flower to pieces; indeed it should not be permitted in any infants' school." This

last strongly flavors of the sentimental attitude, which is clearly shown in the vague paragraphs headed "standpoints with regard to the child;" and in various quotations. (page 44) "we desire to help the children in this process of spiritual evolution without detracting from the wonder of the phenomena by any questions or explanations which may destroy vigor of mind;" (page 139) in describing a burning log, "our beautiful fir-tree was giving us back the little sunbeams which it had stored up during its life in the forest;" (page 6) where the fruit of the plane tree is called "Nature's own little ball on a string" (Children under nine would not voluntarily and understandingly use the word "Nature," nor would the word, if given by the teacher, add anything to the child's pleasure in the ball and string idea). Such lessons as those given on pages 49, 59, 90, and 92 indicate that too much time is spent on details and that the teachers talk too much.

As to the illustrations, it is probably not too severe a criticism to say that the book as a nature-study book gains little by their use. Miss Latter is so fond of her "tinies," as she calls them, that she fails to recognize the sameness of many of the illustrations; or the lack of force or appropriateness in some of the titles of pictures, such as the quotation "There are more things in heaven and earth, than are dreamt of in our philosophy" under the picture entitled "transplanting carrots" on page 87; or the one opposite page 166 (a child sleeping) where "gentle sleep" takes too prominent a part for live nature-study work and the wide-open mouth of the child suggests to medical readers a case of adenoids demanding immediate attention, rather than any other title.

TEACHERS COLLEGE, JEAN BROADHURST
COLUMBIA UNIVERSITY.

Entomology with Reference to its Biological and Economic Aspects. By J. T. Folsom, Philadelphia: Blakiston. 1906, pp. 485, 300 figs. $3.00.

This new book does not compete with the well-known Comstock's "Manual of Insects" and Kellogg's "American Insects," for these give great attention to classification while Dr. Folsom emphasizes biological and economic relations as illustrated by common insects. Although intended as a text-book for students specializing on insects, it is well adapted to general readers who want a fairly complete account of the general biology of insects.

Half Hours with Mammals. By Charles Holder. New York: American Book Company, 253 pp., ill. 60 cents.

In this, the latest addition to the series of Eclectic Readings, the story of the mammals has been presented in simple and untechnical language, and in

an interesting manner. This volume gives the student a good general idea of the structure of the mammalia, the principal species, their geographical distribution, and their relative economic importance. Many notes and incidents from personal experience are introduced. The book has numerous illustrations.

Forest Friends. By J. Madden, Chicago: McClurg. 1907.

A story of a boy pioneer whose parents emigrated from the East to a forest home on the shores of Lake Michigan. Of course there were numerous opportunities to observe wild animals and to make friends with many of them. Human interpretation of animal behavior is prominent throughout the book, but it will probably interest many boy readers.

Water Wonders. By Jean M. Thompson. New York: Doubleday, Page, 1907. pp. 233, 152 ill. $1.10.

The new book in the "Every Child Should Know" series deals with dew, frost, snow, ice and rain. On the whole, it is suitable and interesting reading for children, but rather long drawn out. The photographs of snow crystals and other water forms are excellent. It will suggest some interesting lessons for nature-study in schools.

NATURE-STUDY AND SCIENCE NOTES

[EDITOR'S NOTE. This department will be conducted by Chester A. Mathewson, of the High School of Commerce, New York City. Notes and suggestions may be sent to him in care of the editor of THE REVIEW.]

Results of Animal Study. *School Science* for October contains a stereotyped article on the "Study of Animal Life," by A. P. Froth of the Spokane High School. It calls attention to the educational value of zoology, showing the importance of first-hand knowledge and laboratory training, but winds up with the paradoxical statement: "An interest results leading to a desire to read with something more than mere entertainment such books as Kipling's 'Jungle Books,' Seton Thompson's 'Wild Animals I Have Known,' 'Lives of the Hunted' and others of similar nature." The article is mentioned here merely to call attention to the fact that if our nature work is to have only the ephemeral results mentioned in the above quotation it is quite fruitless.

Insect Collecting. The Pennsylvania Department of Agriculture has issued a twenty-page pamphlet on insect collecting which will prove useful to teachers. It deals in a practical way with the various questions confronting the teacher who has had little or no experience in insect work.

New Botanical Garden. The *American Botanist* for September contains an interesting account of the establishment of a botanical garden on rather new lines in the city of Minneapolis. The teachers have experienced increasing difficulty from year to year in obtaining suitable

plant materials, and by interesting the State University, Park Board and many citizens, they have succeeded in having suitable land set aside. The Park Board provides for the labor, etc., while the teachers control the management. Artificiality is tabooed, the attempt being to retain all the indigenous species and to add other plants needed. Sixteen species of trees, twenty-five of shrubs and numerous herbaceous plants are found within the confines of the garden, among the latter, pitcher-plants, sundews, cypripediums, trilliums and others usually rather hard to find. The idea is one that may well be copied in other cities.

Dogfish. A recent bulletin of the Bureau of Fisheries contains the results of four years' study of the problem of the destruction wrought by dogfish and the available remedies. Two common species of dogfish destroy lobsters by the hundred thousand, and mackerel, herring, etc., by the millions, besides inflicting vast damage to fishing gear along the whole Atlantic Coast. The author points out that dogfish are valuable not only for their hide and liver but also as food, notwithstanding the prejudice against them. The solution of the problem then is an expansion of dogfish fishing which will result in a depletion of the numbers of this animal similar to that of other economic fishes.

Russian Mulberry. A recent circular of the Forest Service calls attention to the value of the Russian Mulberry as a commercial species in this country. This tree was first introduced into the United States in 1875 and is now widely planted throughout Nebraska, Iowa, Kansas, Oklahoma and Indian Territory. It will endure almost any amount of drought and neglect, and is quite free from parasitic fungi. In the states named this tree is quite valuable for fence posts, producing good ones in ten to fifteen years. The wood has a high fuel value, and the habit of the tree makes it an ideal windbreak.

Protection of Game. The U. S. Biological Survey of the Department of Agriculture has isued a useful circular under the title "Directory of Officials and Organizations Concerned with the Protection of Birds and Game, 1907."

Hawks and Owls. In a bulletin published by the Biological Survey, it is pointed out that there is a great deal of ignorant prejudice against hawks and owls. Most species of these birds do more good than harm, destroying mice, squirrels, insects and other harmful animals in great numbers. Many of them are locally injurious on account of the scarcity of the sorts of animals just mentioned and they must, perforce, attack the farmer's poultry. The species that are always injurious are gyrfalcons, duck hawk, sharp-shinned hawk, Cooper hawk, and goshawk. Nearly two-thirds of the birds of prey in this country are more beneficial than harmful.

Periodical Cicada. A bulletin issued by the government during the summer contains an exhaustive treatment of the habits, characteristics, distribution etc.,of the various broods of cicadas. The account is written in a most interesting manner. As to the origin of the various broods, it is inferred that at a very remote period the insect was represented by a

single brood. In the long course of geographic, climatic and topographic changes this early brood became broken up into many broods, and whereas the date of maturity was at first synchronous for all, there followed a gradually increasing divergence in this date. At present every year has its brood or broods, limited as a rule to well defined areas, each reappearing with absolute regularity. Most of the twenty broods have been carefully studied and their dates and limitations marked. The thirteen-year broods are distinctly southern and the seventeen-year northern. One of the common popular superstitions in regard to this animal is that it has a harmful, not to say fatal sting. The evidence shows that this idea is quite without foundation. The insects are very sluggish when handled and can never be provoked into resentment. The author appends to his account a voluminous bibliography covering a period of nearly two hundred and fifty years.

Tree Planting for Profit has hitherto not been very successful, but actual statistics gathered in Illinois and published by the Forest Service show actual returns of $4.28 per acre annually from larch and $15.00 from catalpa.

Swallows, according to a recent Biological Survey bulletin, are the "light cavalry of the avian army." Specially adapted for flight and unexcelled aerial evolutions, they are experts in capturing insects in midair. They eat nothing of value to man except a few predacious bugs and wasps, and in return for their vast service, ask only harborage and protection. Their service to the cotton grower can scarcely be overestimated, because of their skill in catching prey on the wing. They get the adults weevils before they have a chance to alight on the cotton bolls and lay their eggs.

Soil Fertility. Few scientific theories have stood the test of time and experiment so long and gained such universal acceptance as the Liebig theory of soil fertility. Nevertheless, recent investigations seem to indicate that this conception is likely to undergo considerable modification in the near future, suggesting that the "exhaustion" of many soils may be due, not so much to the withdrawal of mineral constituents as to the accumulation of certain organic toxic substances.

Investigations at the Woburn Experimental Fruit Farm, in England, have shown that the presence of grass in the soil about apple trees has a marked deleterious effect upon the growth of the trees. It was shown experimentally that this effect could not be due to removal of nutrient materials, nor of water, nor to the exclusion of air, and it was suggested that it must be caused by poisonous bodies emanating from the grass roots. A similar antagonism has been shown to exist between butternut trees and cinquefoil, and between peach trees and several herbaceous plants. In 1904, Livingston published evidence to the effect that bog water exhibits properties of a toxic nature and suggested that the xerophilous character of bog plants may be due to these properties.

In Bulletin 23, of the U. S. Bureau of Soils, it was shown that the unproductiveness of certain soils examined could not be attributed to any lack of available mineral matter, and that the injurious properties of the

soil could be transmitted to its aqueous extract, independent of the salt content. In later publications from the same bureau, evidence was presented in favor of the idea that certain poor soils contained toxic substance which act to retard the growth of roots. Further evidence favored the conclusion that wheat roots give substances toxic to themselves, and that this toxicity, as well as that of the soils mentioned above, can be removed from nutrient solutions or soil extracts by the absorbent action of carbon black, ferric hydrate, and other finely divided inert solids.

Two recent bulletins (Nos. 36 and 40) from the Bureau of Soils have contributed more information on this subject. In Bulletin 36, Livingston and others give more evidence in favor of the existence of toxic bodies in unproductive soils and add certain points as to the nature and origin of such substances. The conclusion is that toxic material is present in certain unproductive soils, either in very minute quantities or in a very slightly soluble form; that this material is volatile in some cases and in others non-volatile; that it is often destroyed by boiling the soil extract in which it occurs; that it is often accompanied by an acid reaction of the extract, but that in such cases the toxicity is not due to the acidity as such; that it is probably organic in its nature; and that it is absorbed by finely divided solids. As to the origin of such material, it is shown that toxic properties appear not only in nutrient solutions in which wheat is growing, but also in pure sand when this is used as a medium for growth. Similar substances appear to diffuse from soaking wheat seeds, and a similar toxicity is exhibited by the washings from the leaves and bark of certain trees.

The importance of all this to scientific agriculture is evident, and the changes that these considerations may bring about in the theory of soil fertility may be very profound. The beneficial effects of crop rotation may be explained equally well from the standpoint of the Liebig theory or of this newer one. [*Plant World.*]

Primary Nature-Study. A series of excellent lesson-plans and suggestions for first and second grades of the New York State Syllabus of Nature-Study is given in the "Home Nature-Study Course," (Cornell University) Vol. III, No. 1 and No. 2. Mrs. Comstock and Mr. Spencer are the authors.

Minnesota Leaflets. Some interesting nature-study leaflets for local use in schools, home study and correspondence are being edited by Florence E. Lillie, Minneapolis, Minn.

Sportsmen as Game Savers. The following interesting notes are from a recent letter by Dr. W. T. Hornaday to the editor of the *New York Times*.

Of all the game laws throughout the world that are in effect to-day, at least nine-tenths of them owe their existence to the initiative, the hard work, and the money expenditures of sportsmen. But for the work of American sportsmen in protecting wild life from the pot hunter, the market hunter, and the game butcher, there would hardly be a game bird or a game mammal left alive today in the United States. In this country there are at least 400 permanent organizations of sportsmen, formed chiefly for

the purpose of protecting wild life. In this state [New York] alone there are over fifty. Since 1880 the aspect of hunting and sportsmanship has completely changed. The time was when every sportsman felt that it was right to kill as much game as he pleased. Today it is only the pot hunter and game butcher—but no sportsman worthy of the name—who feel that way. The real sportsman takes toll of the wilds, but now he kills very sparingly, and often hunts harder with his camera than with his rifle. Fifty years ago there were no game laws in America. Today there are hundreds in force. When game is seriously threatened, who is it who first proposes better and more stringent laws? The sportsmen. Who does the work necessary to secure them? The sportsmen. Who pays out cash for game-protection campaign work? The sportsmen, and their personal friends.

Where is the nature faker who ever lifted one finger to secure the protection of any wild life? So far as I can learn, nowhere!

"Cecropia's Love Story." A well known zoologist has called attention to an article with this title in a recent issue of a normal school magazine. The zoologist wants to know whether this is approved nature-study. We have advised him to call it literature, and that not for schools. We quote the first paragraph which is typical. Perhaps it is all right; but such things make an unfortunate impression on the men of science whose hearty approval nature-study must have before it can be considered established.

"The night was fit for lover's dreams. The moonbeams from a widening cresent fell slantwise through the lattice of clustered blossoms, whose fragrance distilled into the gentlest of spring breezes. It was no wonder that the rapture of mere existence merged into passion, or that Samia's whole being thrilled at the touch of her handsome suitor. His strength, dash and hardihood were quite enough to please so fair a mistress, although his beauty was scarred with the marks of gallant frays. From Samia the bloom of youth had not begun to disappear. She was clothed in all the exquisite freshness and elegance of a debutante. As she lightly moved or poised in graceful attitude,her whole being seemed the incarnation of radiant beauty and perfect happiness. The world was full of charm for this winsome child of the sunbeams and zephyrs; life was pulsing with unabated energy and zest; suitors were all gallant lovers and she carefree."

NATURE-STUDY AND SCIENCE BOOKS RECEIVED

Good Health. By Frances Gulick Jewett. A Primer of hygiene. Pp. 172. Boston: Ginn & Co. 1906.

The Spirit of Nature-Study. By Edward F. Bigelow A series of very readable essays full of inspiration. Pp. 222. New York: A. S. Barnes & Co. 1907.

Fingerposts to Children's Reading. By Walter Taylor Field. For parents, teachers and librarians. Pp. 276. Chicago: A. C. McClurg & Co. 1907.

Elements of Agriculture. By J. H. Shepperd and J. C. McDowell. A

high school text book. Pp. 254. St. Paul, Minn. Webb Publishing Co. 1905.

Practical Zoology. By Alvin Davison. An elementary text-book for high schools. Pp. 368. New York, Cincinnati, Chicago, American Book Co. 1906. $1.00.

Town and City. By Frances Gulick Jewett. A pupil's book of elementary hygiene by a new method of approach. Pp. 272. Boston: Ginn & Co. 1906. 60 cents.

First Book of Birds. By Olive Thorne Miller. A children's book for beginning the study of birds. Pp. 149, illustrated. Boston: Houghton, Mifflin & Co. School edition, 1906. 60 cents.

True Bird Stories. By Olive Thorne Miller. A series of strictly true stories, many of the birds being pets owned by the author. An excellent book for children, Pp. 156, illustrated. Boston: Houghton, Mifflin & Co. School edition, 1906. 60 cents.

Animal Micrology. By Michael F. Guyer. Practical exercises in methods of microscopical study of animal materials. Pp. 240. Chicago: The University of Chicago Press. 1906. $1.75.

Half Hours with Mammals. By Charles F. Holden. A reader for children. Pp. 253. New York: American Book Co. 1907. 60 cents.

Forest Friends. By John Madden. Woodland adventures of a boy pioneer. Pp. 260. Chicago: A. C. McClurg. 1907. $1.25.

Practical Lessons in Biology. By Clarabel Milliman and J. W. Ball. A pamphlet based on New York course of study in high school biology. Pp. 93. Rochester, New York: Ball Publishing Co. 1906. 50 cents.

The Frog Book. By Mary C. Dickerson. The great book on the subject of frogs and their near allies. Pp. 253, illustrated. New York: Doubleday, Page & Co. 1906.

Half Hours with Fishes, Reptiles, and Birds. By C. F. Holden. A reader for schools. Pp. 255. New York: American Book Co. 1906. 60 cents.

The Sunshine Primer. By Marion I. Noyes and Kate Louise Guild. "The child's first book." Pp. 128. Boston: Ginn & Co. 1906.

With Pencil and Pen. Language lessons for Primary Schools. By Sarah Louise Arnold. Pp. 127. Boston: Ginn & Co. 1906.

The Reptile Book. By Raymond L. Ditmars. An exceedingly readable and authoritative account of snakes, lizards, turtles, alligators. Pp. 272, illustrated. New York: Doubleday, Page & Co. 1907. $4.00.

Water Wonders Every Child Should Know. By Jean M. Thompson. Familiar marvels of dew, frost, snow, ice and rain. Pp. 233, splendidly illustrated. New York: Doubleday, Page & Co. 1907. $1.10.

How Ferns Grow. By Margaret Slosson. The development of fern leaves. Pp. 156. New York: Holt & Co. 1906. $3.00.

Elementary Botany. By C. E. Bessey. Field work month by month. Pp. 109. Lincoln, University Publishing Co. 1904. 35 cents.

Practical Physiography. By H. W. Fairbanks. A thoroughly modern text-book for high schools. Pp. 542, 304 illustrations. Boston: Allyn and Bacon, 1906. $1.60.

THE NATURE-STUDY REVIEW

The regular issues of this magazine have 32 pages. Eight pages have been omitted from this number, because proof of a certain article has been delayed in the mails. A later number will contain extra pages.

THE AMERICAN NATURE-STUDY SOCIETY

The Organizing Committee has decided to call a meeting at Chicago early in the week beginning December 30th. A full announcement regarding the meeting, railroad rates, etc., will be made in the next number of the REVIEW, which is in type and nearly ready for publication.

The co-operation of readers of this magazine in getting applications for membership in the new society is greatly needed. Also many regular subscribers whose connection with nature-study makes it certain that they will enroll as members have not yet sent their names. To avoid mistakes please follow the order form printed on the second cover-page of this issue.

Organizing Committee—L. H. Bailey (*Chairman*), M. A. Bigelow (*Secretary*), C. F. Hodge, O. W. Caldwell, S. Coulter, H. W. Fairbanks, V. L. Kellogg, Anna B. Comstock, D. Lange, Alice R. Northrop, M. F. Guyer, F. L. Stevens, W. Lochhead, C. R. Mann, Mrs. L. L. Wilson, E. F. Bigelow, J. F. Woodhull.

[Note—Mrs. Northrop was nominated by a large number of teachers in New York City, and her name should have been included in the list published in the September issue of this magazine. Professor Baldwin is in Europe and unable to work with the committee.]

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Secretary of Organizing Committee American Nature-Study Society,

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WANTED VOL. II, 1906

Many new subscribers want to purchase Vol. II, 1906, complete. If you will sell your set for that year, please state price wanted.

THE
NATURE-STUDY REVIEW

DEVOTED TO ALL PHASES OF NATURE-STUDY IN SCHOOLS

VOL. 3 NOVEMBER, 1907 No. 8

TEACHING THE RENEWAL OF LIFE IN NATURE-STUDY

By MARGARET W. MORLEY

Author of "Bee People," "Renewal of Life," etc.

[EDITOR'S NOTE—The subject of sex-instruction is now arousing much discussion, probably because a number of societies, notably the American Society for Sanitary and Moral Prophylaxis, have given it attention. It is admitted by all educators who have followed the recent discussions that some very difficult and extremely delicate problems are under consideration, and that at present we can not as teachers safely go far in putting into practice many interesting suggestions derived from the discussions. Probably many readers of THE REVIEW have ideas or notes on experience which they will gladly add to the following review of the problems involved.]

Nature-study is the latest development in education, or in its broad sense one might say in civilization. Man has always looked at the stars and conjured by them, but it is only recently that he has turned his eye upon the plants, the insects, the animals, large and small and studied them, not for seasons of superstition, not for economic purposes, but for purposes of culture. He thinks he discovers something about himself through questioning the lower forms of life.

Evolution might be defined as Intelligence struggling for Personality through progressive physical forms. Nor is there any sign that the struggle ends with the man of today. Life continues to go upward. The only difference is that the problem has become to an extent self-conscious. The man of today asks, what can I do to hasten the disappearance of the mental and moral appendixes, "survivals" inimical to the welfare of the human being?

Long ago it was stated that what the man became depended to a marked degree upon how the child was trained. A few comprehended this, and everybody said it. More and more the people

are coming to believe it and to desire for their children certain advantages of education which perhaps they themselves did not have. Not only is the necessity of technical education for money earning and physical education for bodily development realized, but also the equal necessity of an education that shall harden the moral fibre, so to speak. Man sees today with a long eye. He knows very well that ulcers will destroy unless cured. So he is restless in the face of the tremenduous misuse of power taking place in every direction from the government of the municipality to the self-government of the individual. What can he do to escape the threatened destruction? How can he fortify his children against the ever-increasing dangers? What can he do towards removing those dangers? These are the questions he is continually asking himself.

One great problem, among the many problems of social life, always remains—others change their form and pass on—this neither changes nor passes. It is the problem, broadly stated, of the conservation of the creative energy. This energy, which is the greatest dynamic force of the universe, wrongly applied is the most destructive agent in society; and because of the sovereign necessity of its exercise becomes in a necessarily restricted and artificial social organization like our own, a menace to the physical and moral health of the community.

How then is this danger to be averted? This sovereign power applied to save instead of destroy the higher civilization, upon the outer rim of which man seems now to stand, looking forward? Undoubtedly the prevailing *idea* must be changed. The idea of the barbarian, the savage, the physical man, must be replaced by the idea of the new man, the man about to be civilized, the prophet, if you please.

Superstitions die slowly, particularly those that encourage self-indulgence. Consequently the rising civilization, in order to rise, has to face and strangle the most deep-seated and deadly of all superstitions—that of the necessity, or, at least the unavoidability, of perverting the physical creative power, and the new idea on this subject must be planted in the mind of the child, it must grow with his growth, sink into his sub-consciousness, as it were.

Heretofore this subject has, as a rule, been dealt with inadequately, if at all, in the home. Too often it has not been dealt

with at all, the youth being allowed to gather his knowledge and shape his ideal of the conduct of life from chance and generally harmful teachings. There is another idea slowly gathering force today. In many homes the parents conscientiously fulfil the duty of instructing the child as to the nature and control of these powers. But this is not enough. All homes do not give this instruction. Moreover, the need for general respect and change of idea and ideal with regard to it is becoming more and more apparent, the need that the current of thought which finally becomes the overwhelming force in social life shall set towards pure thinking and speaking and living in this matter.

This current of thought must be strengthened in as many directions as possible, and since there is great value in its being started in the mind of the child, to grow with his growth, to sink into his sub-conscious mind, to work automatically as it were, there is opportunity for the school to do a very important work in getting the subject accepted, as it has already done in the study of general physiology and in other directions. It is a task that must undoubtedly fall upon the school in the future, the only question being how and where to begin so as to accomplish the most good and make the fewest mistakes.

One important step is to give the young mind a worthy conception of the facts of the reproductive life; to make it feel as well as know that the creative power is the most wonderful as it is in the abstract the most beautiful fact in nature, to be thought of and at all times spoken of with respect; to fasten in the child such a sense of the dignity and beauty as well as the value of the "mystery of life" as will influence his attitude to the subject later when to this teaching may and should be added the new word of science, as it has always been the word of the philosopher and of the moralist, that man is superior to his physical cravings; that he not only can but must for his own moral, mental and physical best-being, exercise dominion over his appetites. At least the seed of this conception of duty can be sown in childhood, and to an extent in the schools.

The advent of nature-study has suddenly opened a door to this important work, the approach to which has hitherto seemed so difficult, enabling the teacher easily to be a hitherto unattempted work for society. The teacher should have a clear idea of the end to be accomplished, and then seek the means best suited to

reach that end. The end is two-fold; (1) to give the child a clear straight forward, utterly clean conception of the origin of living things, (2) to make him respect and control his own powers.

In the Primary School the teacher has a very limited field, being able to do no more perhaps than to give in a general way, through nature-study, some idea of the beauty of the mystery of life and the fundamental necessity of the procreative power—to cause the child to respect the subject in short. The best possible field for this impersonal beginning work is perhaps the botany lessons. Since the modern method of teaching botany begins with function instead of structure the plant affords almost as good material as the animal in this field—in some respects better, through its very impersonality and beautiful material giving a certain poetic force to the subject less easily obtainable in animal forms.

The first step should be to make the child love the plant, and this is easily done by arousing in him a vivid sense that it too is alive. It breathes, it feeds, it is beautiful, it has ways of accomplishing its ends. It has honey for the bees and butterflies, it wears bright colors for the sake of being beautiful, and to entice them. It reproduces itself in its seeds. The mystery of its reproduction through the seed should be dwelt upon but in no wise separated from its other functions. The renewal of life should never be set apart as a thing by itself, as something peculiar, different from the other phenomena of life. It should rank in the child's mind as one of the fundamental, necessary, admirable facts of physical existence, to this end much or little detail being given according to the age and condition of the pupils.

Beyond the merest beginnings the teacher of the lower grades can not go with safety, excepting to keep an eye on her flock and by her attitude wherever the subject may happen in any form to arise, to establish a standard of thought and of speech; and by personal, private help, caution, advice, instruction to needy individuals, and wherever possible by assisting the parent to understand and cooperate.

To do even this much the teacher herself needs to be thoroughly educated in her subject. She must know where the road leads to and something of its details before she can hope to lead others successfully over it—or over even the beginning of it. Sound teaching of the teachers is a very important first step in this matter.

The superstition that this subject must be approached secretly and as it were in the dark like some wrong thing is a superstition which needs to be speedily laid to rest. The subject whenever approached at all should be handled openly with a clean frankness that admits of no wrong interpretation, arouses no unruly elements and gratifies in a legitimate way the natural curiosity of the child which otherwise may become morbid, feeding unwholesomely upon the imagination or seeking gratification from unworthy instructors. This phase of the subject can be best dealt with in the home, the teacher having little opportunity here excepting through her power of assisting the parent.

While the work in the lower grades is necessarily very limited, in the higher grades it becomes less so until finally in the upper grades of the grammar school and particularly in the high school the limitations are practically abolished, taking for granted that the teacher is skilful in foreseeing and avoiding pitfalls. Here is opportunity to do memorable and telling work. Here preeminently the "biology class" if it exists or if not the botany or physiology class can be made the medium of conveying most precious truths. The age of the pupil is of the greatest assistance not only because he is peculiarly susceptible to this side of life and eager to understand it, but because he is at that place where the broad generalizations, speculations, thoughts of the universal, appeal to him with peculiar force. Now is the time to strengthen the conceptions of a well-taught childhood, or to give a new and powerful impression where early ones have been harmful or have not existed. Now is the time to appeal to the sense of mystery, poetry, chivalry, desire to know abstract truth which is stronger in adolescence than at any other period. At this time can be made impressions so strong that they must color the whole afterthought of the pupil. But here the teacher needs skill, knowledge and above all discreet sympathy with this unfolding life of the man, the woman. He must be master of his subject, able to handle it with a certainty that shall command respect and instil into it a powerful sentiment which shall be devoid of sentimentality.

Through nature-study the teacher should come as much as possible into personal relations with the pupil. Field work is a great help in this, gives opportunity for informal talks and suggests diversions in one direction and another, so that where the

opportunity presents itself naturally, as it surely will, the teacher can elucidate the most important truths of the reproductive life and become a valuable factor in inculcating the new ideal.

For instance, through the work in structure and function of either plant or animal the idea of the reign of law can be strongly impressed. From beginning to end nature-study should enforce a consciousness of the reign of law, of the necessity of obedience, of the immediate or remote consequences of disobedience. Respect for law should be inculcated in unostentatious teachings from the lowest primary to the highest high-school grade. A sense of the beauty of law, of its beneficence, a vivid feeling that it acts as a friend not as an enemy, should be a part of the treasure of the heart as well as of the mind that the child takes into life with him as a result of his school teachings. In this connection the laws of heredity can be helpfully discussed, the value of this mysterious force of inheritance and the value and duty of transmitting to posterity strength instead of weakness. A sense of responsibility to the future can be impressed on many young minds even to the point of serving as help in time of need. As the work unfolds and the interest increases the skilful teacher of the higher grades can introduce ethical and moral problems connecting the physiological side of the subject with the social side. And of course, in physiology as a subject the teacher should not fail to handle clearly and as exhaustively as circumstances permit the physiology of the reproductive life, here too connecting the physical and ethical aspects of the subject.

Such teaching could not fail in time to create a powerful body of thought in the right direction. In the beginning there might be difficulties, though were the work conducted cautiously enough in the lower grades and with wisdom in all, there ought to be little opposition encountered; and in the near future the school could rank among the most efficient assistants in raising the moral tone of the people on the subject of the reproductive life.

METHODS IN NATURE-STUDY

By ELLIOT R. DOWNING, Ph.D.

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"Enough of science and of art!
Close up those barren leaves.
Come forth and bring with you
A heart that watches and receives."

Nature-study is not so much a new study in the curriculum as it is a new method in pedagogy. The child comes to school with his own interests, generated by the stimulating contact with his environment, during a series of very impressionable years. He has been living out of doors and the great busy world has been crowding varied experiences upon him. He is filled with wonder and question. All time has been playtime—a fascinating companionship with "Nature the dear old nurse." From these very real and delightful experiences the child comes to school, and immediately all preconceived notions of values are discredited. The outside world, so full of delights, is ignored, and the scope of his development is limited by the covers of books. Nature-study attempts to obviate this hiatus in methods. It demands that books shall supplement not supplant experience.

"Books, 'tis a dull and endless strife,
Come, hear the woodland linnet.
How sweet his music! On my life,
There's more of wisdom in it.

"And hark! how blithe the throstle sings.
He, too, is no mere preacher.
Come forth into the light of things.
Let nature be your teacher."

First, then, the teacher must get out with the children into their normal habitat. She must needs renew her interests and rejuvenate her dulled senses. Often she must confess her ignorance, for pupils may know more of the objects encountered than the teacher. This is a consideration that deters many a teacher from making a beginning, because she fears to endanger her prestige. It will, however, establish much more intimate relations between pupil and teacher if the latter will take this opportunity to let the children instruct her. We have grown so accustomed

to the notion that teaching consists in imparting a certain definite amount of knowledge that it is difficult to realize the teacher may still teach while ignorant of the facts involved. Information is not the prime desideratum in nature-study. It is a spirit of investigation and appreciation. Surely the teacher may lead the pupils in these.

The field work in nature-study meets objection from the parents, frequently, who feel that school time should not be frittered away in running about out-of-doors. This is an objection that may best be met by avoiding it, until parents realize that frequent recreation is an imperative need with the easily fatigued nerve centers of the child, and that the fresh air work is no loss but a distinct gain. The teacher may well afford to utilize time after school, or even on Saturday to go out for the nature-study rambles with her pupils. Nothing can quite take their place. Nature-study will continue to be a prefunctory performance until the teacher acquires the joy of tramping out-of-doors.

Merely getting out, however, is not enough. A picnic is not necessarily nature-study. The teacher needs to see to it that the pupils accomplish some real work while out. This means careful planning of the lesson and relating it to the year's course; a preliminary survey of the route insures finding the things wanted. Then the pupils must be held to the plan. Naturally interesting things not foreseen will be encountered. The lesson plan may not be too rigidly adhered to, yet elasticity must not degenerate into aimlessness.

These ideal out-of-door lessons may not always or everywhere be feasible. Winter will necessitate utilizing, in part at least, material that may be kept and reared in the schoolroom. Possibly city conditions may preclude all work with animals and plants in their native haunts. Yet the out-door world is still the child's world. The sky-line may be a silhoutte of buildings instead of green hills, pavement may replace broad fields, and alleys the country lanes; yet all this is a very real and interesting environment. The city child's experiences are quite unlike but just as absorbing as those of the country-bred lad; and it is these experiences we are trying to make the stepping stones to education. We may need to plan the work on a basis of industrial evolution rather than with organic evolution in mind, yet the aims and

methods of procedure may be nearly identical. The sky, the air, the surface features, the physical and chemical phenomena presented at every turn by commercial processes and the industrial operations, present quite as varied if not quite as poetic an environment as has the country child.

This out-of-door work with its variety of objects and consequent multiplicity of stimuli assures complete sensory training—an end we deem important. The teacher needs to intentionally widen the scope of the work so that this varied stimulation shall be achieved rather than pursue some narrow field only, where the sensory stimuli are necessarily limited both in kind and intensity. The child delights in handling things and the natural objects are sure to provide his tactile end organs with all sorts of thrills. How much of the language of mineralogy is in terms of the muscular sense. Herbs and fruits, as well as the common chemicals handled in the simple experiments, provide a host of experiences for his taste bulbs. The olfactory organs are constantly appealed to by the delicate odors of flower and field, while bird notes will tax the accuracy of ear to hear and of vocal organs to reproduce. The eye acquires skill in measurement, too, as the familiar home region is mapped or contours are traced. Then what a range from the tiny particle in hand to the immensely great that is infinitely distant! And what a wealth of color the rocks and blossoms supply.

Drawing may well be correlated with the nature-study to cultivate appreciation of form and color. It is surprising what admirable results may be achieved by the very little people working with water-colors. They belong to the impressionistic school, but the adeptness they display in discerning and depicting form and color is really surprising to an older bungler who has not tried to acquire the art until mature years. It is a tempting digression to point out that such training has its commercial values. Boys are four times as apt to be color-blind as girls, thus imperilling our lives by land and sea until women shall take men's places, too, as locomotive engineers and pilots. This is not an isolated case but a familiar one that points to the fact that sensory training has large commercial values. Instances might readily be multiplied.

In a preceding article it has been suggested that such material be selected for study as lends itself to problem form. The application of the idea needs some discussion in considering methods.

Concrete examples may serve our purpose best. Suppose the work is on the trees of the neighborhood and the lesson for the day is on the common oaks. The teacher might go with the pupils to see various kinds of oaks, might point out the distinguishing features of each while they take notes, make sketches and collect leaves and fruits. This is an excellent method of procedure when the aim is to impart a knowledge of the several species. If, however, we endeavor to train independent observation, the unknown may be advantageously introduced. Let the trees be visited, named, sketched and collections made, as before, but do not give the distinguishing features. Let the pupils work that out for the next day. Here, as in all the work, the students need to be forced into independent observation.

This much is sufficient in the lower grades. Later, however, in harmony with our changing aims, certain facts need to be retained and utilized in working out conclusions. Imagine, again that we are studying the children's pets, during some winter terms when out-of-door work is largely impracticable. Squirrels, rabbits, cats, dogs, pigeons, canaries or other vertebrates are readily kept for weeks in the schoolroom, or may be brought from home daily as required. The little people will enjoy watching how kitty, for example, eats, drinks, sleeps and plays. They will have much to tell about their own kitties and will make keen observations on the differences in behavior of the several animals that are studied. Simple experiments are easily devised for intermediate grades. Thus a piece of meat may be put in some rather out of the way place, under the teacher's desk perhaps, and a cat be admitted that has been kept without food for several hours. All must keep still now and see how long she requires to find it and how she behaves. Try the same experiment next day with a dog and ask the children to state the results and significance of their observations. In still later grades comparative structures may be studied. The children have seen, in lower grades, that both cat and dog gnaw a bone with their back teeth, while the rabbit and squirrel gnaw the bark with their front teeth. They will be keen to discover the differences in character and size of the several sorts of teeth, the correlated differences in food, and to think out, on the basis of their own observations, some fundamental notions of animal relationships.

Recall in the upper grades some additional things the children

have observed: that kitty loves to sleep in a warm nook, evades the cold, walks gingerly in the snow, treads softly on padded feet, stalks her prey, springs upon it with quick leaps, eats deliberately. Now let the children learn by reading of the habits of the lion, tiger, puma—the great cat tribe of the tropics—and they will speedily reach the conclusion that little pussy stands for a whole family whose habits and structures, eminently fit them for a successful struggle for existence. The dog, on the contrary, the children can tell, loves a frolic in the snow, trails his prey by scent and chases it down, his joyous bark drawing into the chase all other dogs within hearing. He eats in gulps with ominous growls. Next learn the habits of the wolf tribe and the pupils realize that the dog is a stranger in their midst, a relative of the wolves, hunting in packs over the dreary wastes of the cold north. (The thoughtful pupil will some day demand adequate explanation of this difference in geographical distribution.) These results may be achieved by a succession of questions which will in turn generate more. Why are the dog's claws dull while kitty's are sharp? What is the color of the dog's eye and why? What is the significance of the cat's slit-shaped pupil? Questions like these will occur to the alert teacher and will serve all along to arouse independent thinking, for they are not stereotyped problems with the answers in the back of the book. The successful teacher must needs be an expert cross-examiner. Questions are the guide of the willing pupil, the goad of the stupid.

My illustration has sufficed now if it has suggested the method by which facts are first observed, then remembered and woven into the solution of problems. The drift of the whole will be apparent to the person who understands current notions of evolution. When, in later years of study, the fossil evidence of the common ancestry of the dog and cat families is encountered, it will seem like the final chapter of an interesting continued story.

Permit brief illustration in another field. Suppose the nature-study is elementary physiography. At first the children are asked to see clearly the action of the common agencies, the rain and wind, rivers, lakes, et cetera. They are not told it all, but are led by careful questions to see it for themselves. Disintegration and construction are watched year by year, as river bank or shore line gradually wears away or new deposits are made. That these deposits are stratified occasional cuttings will show the

older pupils. Simultaneously the rocks of the neighborhood are studied. The out-crops are visited, their strata noted and the texture of the rock, its rounded grains, its component minerals. Perhaps fossil remains are first collected as curios, then studied with wonder, and finally their real significance thought out, when, perhaps at high school, the whole series of contours and agencies, shore deposits, sand strata, rock ledges, all known intimately by virtue of early nature work, fall into their proper places and reveal the story of one's home environment in terms of the world drama. I have seen adult students fairly gasp in surprise and admiration when the hills and valleys, rivers, shore lines and rock ledges with which they had been on terms of intimacy for years, suddenly arranged themselves into an intelligible whole, and revealed the significance of the familiar landscape.

All will agree that the development of upright character is the most important aim in nature-study, as in all education. It is because of a firm faith in the ennobling influence of an intimacy with nature that nature-study—the training by doing things rather than reading of them, the laboratory method—has appealed so hopefully to many educators. Yet this moral impetus is the most difficult to impart. One may not gush with the avowed purpose of transmitting some admiration for beauty and marvelous order to the pupil, nor be ever pointing out the moral. Such sentimentalism is promptly discounted and excellent intention dubbed prudishness. The teacher herself must experience what she would impart, must acquire a contagious enthusiasm. I do not know how this may be accomplished except by getting in contact with some one in whom the fire has been kindled. Read William Hamilton Gibson's, "Eye Spy" or "My Studio Neighbors," as models of accurate observation and artistic appreciation. Study Mabel Osgood Wright's "Four-Footed Americans" as illustrating her happy methods of putting facts together to assist children in working out conclusions, or get acquainted with "Uncle John's" charming ways of suggestive instruction. Study Metcalf's, "Organic Evolution," or Salisbury's "Physiography" to tax your own more mature powers of inductive reasoning. Browse through Burrough's or Thoreau's writings until you strike passages that appeal to you and then study them. Read Van Dyke's "God of the Open Air," Fiske's "Through Nature to God," or Drummond's "Ascent of Man," for inspiring vistas into

the significance of the commonplace. Read the great nature poets. Study the great nature pictures. Good reproductions of Landseer, Bonheur or others, hung where the eye may study them will help in the appreciation of the beauty about one. Put yourself in touch with some one whose eyes have been unsealed, whose lips have been touched with the coal from the altar. Above all cultivate a first-hand knowledge of the out-of-doors. Here rear your shrine and religiously keep tryst with the spirit of nature.

"One impulse from a vernal wood
May teach you more of man,
Of moral evil and of good,
Than all the sages can."

[EDITOR'S NOTE—The first paper of this series by Dr. Downing was published in this magazine for September, 1907, pages 162-167 of Vol. 3; the second paper in October, pages 191-195.]

THE QUESTION OF METHOD IN NATURE-STUDY

By MICHAEL F. GUYER

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[EDITOR'S NOTE.—The article on "Organization of Nature-Study Facts" in the preceding (September) issue of this journal referred in a foot-note on page 170 to the article reprinted below. Owing to the fact that the editor of THE REVIEW had not read Professor Guyer's paper since December, 1905, he failed to recognize that the foot-note did not adequately credit the outline on pages 170 and 171 as an adaptation and application of Guyer's general outline reprinted below. In deference to the letters of readers who have called attention to Guyer's paper and in order to make that interesting paper available for many nature-study workers who have not access to the original article, it is here reprinted from the *Pedagogical Seminary*, Vol. 12, March, 1905. For permission to reprint, the editor of THE REVIEW is indebted to President G. Stanley Hall, of Clark University.

In connection with this and the preceding paper on organization of nature-study it will be interesting to re-read the article by Professor F. M. McMurry, in the *Educational Review*, Vol. 27, pages 478–493, May, 1904. An abstract of this paper was published in THE NATURE-STUDY REVIEW, Vol. 1, No. 1, Jan., 1905. Perhaps other readers can call attention to still earlier suggestions for organizing nature-study lessons.]

The practical question of what material to use is the one which many teachers will say presents the greatest difficulty in nature-study. The writer is thoroughly convinced, however, that it is not so much a question of material as it is need of a practical method. Teachers who have become disheartened in the matter have done so largely because in first facing the question of material, they have overlooked the more fundamental one of method.

Any method, to be successful, must make the separate qualities of a given object stand out to the perception of the child and lead him to make his analysis and subsequent reconstruction in an orderly manner. The problem becomes all the more intricate if, as in the average city school, the teacher is dealing with large classes, for then the formula for analysis must be adapted to fit the weakling as well as the strong; it must be a method of making not only a particular pupil, but all, receive the successive emphasized impressions.

In the case of animals, for example, the first questions for the teacher to decide are, just what is there to see about animals? What can children be led to see?

What questions do children ask about animals? They would run about as follows: What does it do? How does it do it? What's it good for? How does it work? In other words, a child is interested in structure only as applied to action. He wants to know the business of animals and how they attend to it.

It is true that an ordinary crawfish, in terms of structure, is an astacoid macruran decapod, but never mind that. What the child is interested in is that it eats, and what and how it eats. He soon learns that it can protect itself, as is evidenced by the wary way he goes about picking it up after being once nipped by its pincers. He sees, too, that it is adjusted to its physical surroundings, or in other words, that it is adapted to live largely in the water. He can perceive all of these things and more without even suspecting that it is an astacoid macruran decapod, and he will have made considerable advancement in nature-study too.

The following simple outline is, I think, applicable in teaching, from the primary school to the university, for it can be followed out in just as small or as great detail as is desirable. In actual practice it has worked very satisfactorily in a number of the Cincinnati public schools. It is based entirely upon what animals do.

Animals, from their own point of view, have two and only two occupations in the world. These are, (1) to care for themselves, and (2) to care for their offspring. Consequently, every important thing to be seen about an animal has to do with one or the other of these pursuits. This is as true of internal as of external structures; in the nature-study work, however, we confine our attention for the most part to external features.

For taking care of themselves, animals must possess organs (a) for procuring and transforming food, (b) for protecting themselves from enemies, and (c) for adapting themselves to surrounding physical conditions.

This outline will be more easily remembered if studied in tabular form:

THE BUSINESS OF ANIMALS

I. To Care for Themselves.
   a. Food: finding, securing and transforming.
   b. Self-protection.
   c. Adjustment to physical surroundings.

II. To Care for their Offspring.

Thus, the fundamental structures of animals, or plants for that matter, are simply answers to the demands of their business as stipulated in this table. Differences in structure and habits, therefore, are due largely to different methods of meeting these necessities of life. A given organ, once established, frequently fulfills more than one of these functions, but the point is that these and only these occupations concern the animal.

Much of the machinery of any animal is connected with the prime necessity of obtaining food and drink. Unlike plants, animals do not have their food at hand in soil or air. They must seek for it. Thus have arisen the various types of legs, wings and other organs of locomotion. Organs of locomotion alone would be of little service to the animal, however, if it had nothing to direct them; there must be a centre of control and this is provided ordinarily in the central nervous system. The animal requires, moreover, some mechanism to give it knowledge of objects at a distance, hence have arisen such structures as eyes through which it receives information by means of light, ears for sound, a nose for odors, etc. These organs may serve more than one purpose, of course, when once established. They are, for example, as necessary to herbivorous animals for escape from being made food of as to aid them in finding their own food.

When an animal once confronts its food, however, it must still meet the difficulty of getting it into its body. The food is solid, perhaps, and must be subdivided, or it is alive and must be killed before the animal can use it. There must be some organ or organs, therefore, such as mouth, trunk, claws, hands or the like to serve in this capacity, and still modifications of these organs or additional organs to grind or cut the food into small bits that it may be passed on into the body to be digested. Such organs range from the commonplace to the grotesque and their nature depends very largely upon the character of the food; it requires different machinery for killing and rending flesh from that which must serve for plucking grass or for grinding grain.

Before leaving the subject of food it should be mentioned that such structures as those for breathing and for the circulation of the blood are concerned with nutrition no less certainly than the more evident organs of alimentation. The blood distributes digested food to where it is needed in the different parts of the body, and oxygen, which is obtained by breathing, must be

present before the food can be used by the tissues. With very young pupils it would not be desirable, of course, to attempt to lead out the more intricate topics of digestion or of other physiological functions. It should be noted, however, that the whole question of digestion, circulation, etc., can be brought out in a very interesting manner for students of physiology by such an interpretative method. The emphatically important thing, whether in nature-study or physiology, is that the interpretation be made by the child, not by the teacher. The latter should simply guide by means of relevant questions.

It is needless to take the space for a detailed discussion of self-protection and the remaining subjects of the synopsis, because the many simple interpretations along these lines which children may be led to make, are obvious. It may not be amiss, however, to indicate briefly a few of the more general topics.

In defending themselves, some animals, of course, frequently make use of the same weapons as serve them in securing their food. Such structures, on the other hand, as the armor of the turtle or of the armadillo, or the barbed spines of the porcupine, are instances of organs more exclusively protective in nature. Besides the many obvious examples of armor, of fleetness or of strength which serve to protect various animals, much of the color observable would come under the heading of protection from enemies.

Many of the most evident adaptations of animals are concerned perhaps, with adjustment to physical surroundings such as, for example, the element in which the animal dwells. Thus, animals such as fishes, which live in water, must have mechanisms for breathing or for locomotion necessarily very different from those which are terrestrial in habit. Again, flying forms require a type of propelling organs different from that of forms which walk upon the surface of the earth. It is this necessity for physical adjustment, furthermore, that gives rise in cold climates, to the furs, fleeces and downs to be met with in such profusion. Not only structure, indeed, but habits as well, vary under different climatic conditions. The hibernation practiced by some animals is a good example of adjustment to climate by means of habit. It will be found that many structures which may be looked upon as coming under the heading of adjustment to physical surroundings, may also be considered from another aspect under the topic of food.

As examples of adaptations to meet the second business of animals, viz., caring for offspring, may be mentioned the diverse types of cocoons, nests or pouches for housing the newborn, the manifold provisions for feeding the young, and various signals to attract their attention.

Before leaving the synopsis, I wish to indicate, under each of the headings, a number of general questions which will be serviceable in bringing out systematically the various phases of animal life or structure. The questions are comparatively few in number and so simple that a novice can determine answers with some degree of satisfaction, and yet, if one learns the complete answers to them he knows practically all about a given animal that the trained naturalist can ascertain.

The Business of an Animal

I. TO CARE FOR SELF

a. *Food.*

1. What does it eat? Preferences?
2. Do its food habits make it a friend or an enemy of man?
3. How does it get information about its food, *i. e.*, what senses has it? How do they serve it? Are they advantageously located for the work they have to perform?
4. How does it get to its food (*i. e.*, how fitted for locomotion)?
5. What organs are helpful to it in eating? How are they adapted to its particular kind of food?
6. Does it snare or lure its prey? Is its color ever of advantage in securing food?
7. Does it lay up a store of food, or merely eat what it needs each day?
8. Does it work during the day or night?
9. How does it breathe?
10. (Digestion, circulation, etc.,—to be omitted for young children.)
11. *Cf.*, also b, 4.

b. *Self-protection.*

1. What are its enemies and how does it escape them (weapons, armor, flight, etc.)?
2. Can its color or general appearance help it to escape in any way? Has it any means of signalling to its own kind? If so, does such ability protect it in any way?
3. Has it a home or regular place of resort?
4. Does it lead a solitary life, live in a community of its own kind, or live with unrelated forms? If colonial, and if there is division of labor in the colony, what part does each member perform? Differences of the various members in structure and habits?

5. To what diseases is it subject? Can it convey these or other diseases to man?

c. *Adjustment to Physical Surroundings.*

1. Where does it live (geographical locality; ground; water; leaves, roots, or stems of plants; etc.)?

2. How is it fitted in general form and in the special conformation of its organs to its place of abode? *Cf.*, Locomotion and Sensation, 3 and 4 under 1, a.

3. How is it protected against extremes of temperature, moisture or drought? Where does it go in winter? In foul weather?

II. TO CARE FOR OFFSPRING

1. Is the animal an egg-laying form or are the young born alive? If an egg-laying form, where and how does it deposit its eggs?

2. How are the young nourished? What provision is made for their safety? To what extent are they taught by their parents? *Cf.*, also 3 and 4 under 1, b.

3. How long does the animal live? What length of time are the young in maturing?

4. Do the young undergo a pronounced change in form (metamorphosis) while developing into the adult, or do they principally increase in size?

5. Is there rivalry for mates (battle, song, parade of cleverness or of color)?

6. (What changes have come about during the ancestry of the race? Were they advantageous? *To be omitted for children*).

Plants

As regards plants, it is evident that the same general synopsis will answer, for the business of plants is the same as that of animals. While the *same problems* confront plants, the solutions of these problems are largely by *different processes.*

The Business of Plants

I. TO CARE FOR THEMSELVES

a. *Food.* Most plants (*e. g.*, tree) get food from the air (hence leaves) and earth (hence roots); consequently the adaptations of plants must differ from those of animals.

1. No organs of *locomotion* ordinarily, because food surrounds plant.

2. No organs of *special sense* (eyes, ears, etc.) because it is unnecessary for plants to get information of objects at a distance.

3. Besides getting food-stuffs, the green plant must make its own food, hence the presence of special machinery ("leaf-green") and devices for arrangement of the same.

4. Remaining topics (respiration, etc.) noted under animals apply to plants.

5. Plants, not green, nourished largely by organic foods.

6. Insectivorous plants capture insects, etc., for food, apparently.

b. *Self-protection.* Not active opposition or flight as in many animals, but *passive defense* against,

1. Attacks of animals or other plants. Met by
   —Distasteful or poisonous substances.
   —Armor (prickles, spines, thorns, hairs, etc.).
   —Mimicry, possibly in a few.
   —Utilization of allies such as insects, etc.
2. Too much or too little water.
3. Too much or too little light.
4. Extremes of temperature.
5. Breaking by wind, water, etc.
6. Poisons in soil.
7. Competitors for favorable position. (The plant is often aided in this struggle by the possession of long roots, ability to grow in shade, etc.)

c. *Adjustment to Physical Surroundings.*

1. Advantage of greater absorbing surface in vast number of flattened organs (foliage leaves), rather than solid compact top.

2. Similar advantage to plant in having many branched roots instead of a single one for absorption and as a hold-fast.

3. The *light relation* is especially important, since without sunlight green plants are unable to construct food from the gases of the atmosphere and the substances in plant sap. Methods of growth, therefore, are largely to enable plants to get best position with reference to light to do life-work.

(a) *Plant stems.* Two principal methods of development.

(1) Predominant plants of a region avoid too great shading by elongation of stem = *forest* as extreme type.
Climbing and twining plants.

(2) Predominant plants, short-stemmed forms which crowd each other beneath the soil = *prairie* as extreme type.
(Two "societies"—overgrowth and undergrowth—frequently inhabit the same region).

(b) *Arrangement of leaves.* Mat or carpet habits; leaf mosaics; rosettes; shape of leaves as modified by relation to one another on tracts; size of leaf with reference to illumination, etc.

4. Other adjustments must be to heat, the pull of gravity, mechanical forces (as air and water), moisture, soil, electricity, etc., other phases of which have been included under the heading of self-protection.

II. TO CARE FOR OFFSPRING

a. *Propagation.* Seed, slips, runners, etc.
b. *Protection.* Burrs, nuts, green fruit, etc.
c. *Storage of food.*
d. *Provisions for distribution of seed or spores.*
   1. By animals (fruits, burrs, hooks, nuts, etc.).
   2. By wind (floats, wings, tumble-weed, etc.).
   3. By water.
   4. Other devices (plants which shoot off spores or seed, self-propelling devices, etc.).

Finally, if the parallel between the business of plants and the business of animals is pursued still farther, it will be apparent that almost all of the questions indicated for the study of animal life are equally applicable to plant life.

ARE CHILDREN NATURALLY NATURALISTS?

By MAURICE A. BIGELOW

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[EDITOR'S NOTE.—It is certain that many readers will decidedly disagree with statements made in this article. The writer hopes to get from readers their frankest answers to the questions raised.]

For years we have heard the argument that nature-study and high-school science should emphasize the biological, because "children are naturally interested in living things and very little in the lifeless." But is it true that the majority of young children are spontaneously interested in *study* of living things, that they are by nature naturalists? Are not their apparent interests largely reflections or imitations of the interests of their elders? Some illustrations will show the origin of these questions, which must seem decidedly heretical to most teachers of nature-study and biology.

Two children of my acquaintance have long been regarded by myself and many others as remarkable examples of children's spontaneous interest in nature-study. Especially have they seemed to have a never-failing interest in keeping pets, rearing insects, and carefully observing animals and plants. Recently I have had an opportunity for getting more closely in touch with the children themselves, and to my great surprise I have found convincing evidence that very much of their apparent interest in living things is not at all spontaneous; but on the contrary, it is a direct imitation of the interests of a parent. Many of their nature-studies which I had taken to be as spontaneous as play were nothing more or less than definite tasks set by the parent, and the children showed plainly that they regarded them as tasks easier but not far different from learning lessons in school.

Another case: I visited many times a fifth-grade class which was intensely interested in study of birds. I never saw a nature-study class reach such mountain tops of enthusiasm, and it seemed certain that it was an interest which would be carried away from school. Summer passed, and in September the new teacher, at my suggestion, instructed the pupils to write me letters describing any bird studies made during their vacation in the country. Two

or three of the forty pupils had made some observations on birds which came near them, but the majority confessed that they did not remember having seen "any birds except robins and blackbirds and crows." Many wrote that "there were so many interesting things to do that there was no time to study brids." In general, the result was just what might be expected in any other school subject; namely, definite interest so long as a teacher guided and stimulated. There was no evidence that "nature-study is as natural as play."

Another case: A small boy at a country home manifested intense interest in my work of collecting specimens, and daily brought me great quantities of plants, insects, stones, etc. I felt sure that here was natural interest, but after my departure his interest vanished; so much so that six months later when I wrote asking him to collect some grasshoppers, for which I promised one dollar, it was necessary for his elder sister to set him the definite task of collecting. One hour of work was necessary. I am convinced that the boy was not interested naturally in the animals and plants, but that he was simply interested in me and in the novel work I was doing.

These, and numerous similar examples which have come to my attention in recent years have raised in my mind the question which stands at the heading of this article. They have led me to think back to my own boyhood and to re-interpret some of my own experiences, so that I now doubt whether I was naturally interested in the study of living things more than in hundreds of lifeless things. Of course, as an active boy, I was interested in catching butterflies and other animals; but so does my favorite terrier catch moving animals for the pure joy of action, not because she has any spontaneous interest in study of living things. I collected quantities of plant and animal specimens, and why? As I now see it, not because I was really interested in definite knowledge concerning the things collected, not because of an instinctive tendency towards a naturalist's outlook to nature; but frankly, I must confess that I now doubt whether my motive was other than the joy of getting together a bigger and better collection than the other fellows possessed, and *especially* I was stimulated by the intense pleasure derived from showing my collections to older people. Some of my naturalist friends have made to me the same confessions, and so I must wonder whether the collecting

habit means anything in connection with interest in nature-study. If so, why do boys collect postage stamps? The answer seems to be that stamps offer for many boys the best opportunity for the competition so dear to a boy's heart.

Many writers on nature-study have told us of toads and snakes and lizards found in small boy's pockets, and have thought they saw natural interest in nature. But how about those lifeless and unnatural objects found in the same pockets? I fail to see here anything more than the play characteristic of young animals. Young dogs are fond of collecting and a puppy's playground with its miscellaneous assortment of bones, old shoes, sticks, leaves, tin-cans, and especially pieces of cord is equivalent to the small boy's pockets.

Aside from the collecting habit, we are often told that most very young children naturally have a sympathetic relation with animals. I cannot believe this true. I have known certain small boys who would not throw a stone to crush a toad; but it was simply because the old farmer next door had said that "killing a toad would make the cows give bloody milk." I well remember that it was legitimate for these boys to kill frogs, because these animals did not so affect cows. As school-boys we had "sympathetic interest" which kept us from stepping on earthworms, because teacher said that "nice" boys did not do so. We did not openly "whip out" bumblebee nests, because the owner of the land next to the school said that "these bees made clover seed," and that he would spank any boy who killed bumblebees. But somehow our "sympathetic interest" was not naturally or pedagogically extended to harmless garter-snakes, rabbits, squirrels and some other animals which we hunted by methods both fair and foul. Is not this the experience of the typical boy? Where is the evidence of an innate sympathetic interest which may later develop into the naturalist's outlook? Certainly not in the average small boy. It must strike the fair-minded observer that the characteristic ethical and esthetic attitude of a naturalist is in most cases a later development of an interpretation of nature which, like poetry and philosophy, is the product of mature minds.

And now one point with regard to stimulated interest in nature-study. Even here there is not a marked tendency in favor of living materials. It is largely a question of the knowledge and

attitude of the teacher. A mechanical toy or a physical experiment will attract as strong and lasting attention as will a jumping insect or a wriggling worm, provided —and here is the heart of the whole matter—provided that there is action, "something doing." There are teachers who are extremely successful with biological materials; but who can get as much enthusiasm into lessons on magnets and mechanical toys as from beautiful butterflies, agile grasshoppers, and record-breaking amphibian jumpers. The child, again like a young puppy, has interest aroused by action, and it is only in so far as inactivity seems characteristic of certain things in the lifeless world that the child distinguishes between the living and the lifeless.

And what is the bearing of all the above on the present-day problems of nature-study? If children are not as a rule naturally inclined to be naturalists, is our nature-study on the wrong basis? Not at all. The problem has nothing to do with the educational value of *stimulated interest* in nature; but whatever part of our nature-study has been built entirely on the assumption that children are naturally naturalists must be revised. Especially must we revise by giving more attention to the physical side of nature-study, which has practical applications in the every-day life of the average citizen more important than much of our biological nature-study. We have long recognized this to be true, but we have continued to neglect the lifeless nature because we accepted without question the dictum that most children are naturally inclined to be naturalists. Is it true?

INACCURATE NATURE BOOKS

In *Everybody's Magazine* for June, President Roosevelt, as reported by Edward B. Clark, expresses his indignation that, after all that has been said of their inaccuracies, the books of W. J. Long should continue to be used in schools for supplemental reading.

After exposing some of Mr. Long's errors, Mr. Roosevelt remarks: "The preservation of the useful and beautiful animal and bird life of the country depends largely upon creating in the young an interest in the life of the woods and fields. If the child mind is fed with stories that are false to nature, the children will go to the haunts of the animal only to meet with disappointment. The result will be disbelief, and the death of interest. The men who misinterpret nature and replace fact with fiction, undo the work of those who in the love of nature interpret it aright."

Is it the undeniable literary charm of Long's books, or the dearth of desirable nature stories, or the activity of his publishers which, in spite of their proved perniciousness, still keeps them on teachers' lists?

In the April [1907] number of THE NATURE-STUDY REVIEW, a writer speaks of the "fascinating tales of the wilderness, as told by Long, and the delightful life-histories of Wabbles the Song Sparrow and Bismark the red squirrel as recorded by Walton the hermit of Gloucester," and couples them with the "Works of Burroughs and Thoreau," a grouping which we believe will make truth-loving 'Oom John' envy Thoreau his resting-place in Concord's churchyard.

Discussion of this subject with one of the leading educators of the country brought from him the surprising opinion that in the city, at least, it is of more importance that nature books used in supplemental reading should be interesting than that they should be accurate; it being argued that the immediate object of such reading is to arouse the child's curiosity.

Admitting that few children in our city schools have an opportunity to test the accuracy of the information they receive in regard to animal life, is it desirable that they be given as true that which is known to be false merely because it is interesting?

Nature-study is designed not only to make the child familiar with the commoner forms of life, but also so to train his powers of observation that he will see more widely and more accurately; and no form of nature-study which has not science, and hence truth, for its foundation can be expected to endure. [Editorial in June *Bird-Lore*.]

The paragraph above copied from THE NATURE-STUDY REVIEW occurs in an article on "Nature-Study as an Education," by Mary P. Anderson, and reads as follows (page 103):

"During the confusion in regard to the real province of nature-study, it was the privilege of anyone to enter the game and pin a tail on the donkey. The result was incongrous and ludicrous, for the tails were many and varied and some did not even hit the donkey. There was the primitive life

literature including the marvelous "Story of Ab," there were Kipling's "Jungle Stories" and the often beautiful and inspiring stories of Thompson-Seton; there were the fascinating tales of the wilderness as told by Long, and the delightful life-histories of Wabbles the song-sparrow and Bismark the red squirrel as recorded by Walton the hermit of Gloucester; all these were pinned to the curtain together with the works of Burroughs and Thoreau and the great nature-poems of the ages."

It seem clear that the reviewer failed to read the entire paragraph criticized. Obviously Miss Anderson did not recommend coupling in nature-study the books mentioned.

The following extracts from a book-review published in *The Independent* for October 24, 1907, give another estimate of two recent books which emphasize the interpretation of the human side of animal life.

"The Haunters of the Silences," by C. G. D. Roberst, is like its companion volumes, "The Kindred of the Wild" and "Watchers of the Trails," except in the selections of animals as subjects of sketches. The stories are said to be in line with accurate natural history. However, it is not concerning questions of observed facts so much as the interpretations that scientific men will have a quarrel with the author of this and with those of similar books. The fundamental question is whether wild animals think and reason and have emotions and in still other ways closely resemble the psychologic life of the human species. The author emphatically reaffirms his belief that "the actions of animals are governed not only by instinct, but also, in varying degree, by processes essentially akin to those of human reason." But something akin to human reason would hardly be sufficient for many of the situations in this book, for the author's animals do things which only the human mind does. To take one of numerous examples: "As soon as she [the old bear] realized that her strength was failing, she was seized with fear. What would become of the cub if she were killed?" Here the interpretation involves not only human reason in a highly complicated form, but also knowledge of death and its consequences. We may be ready to admit the general proposition that some animals show some similarity to human mental processes, but before we can accept such a reading as the above we must be ready to admit that animals completely equal the human mind in some complicated process. We must also have some proof of how the old bear learned the symptoms of approaching death and on what basis of previous experience she reasoned out the probable consequences to her helpless offspring. When an author plunges so far into the realm of imagination in reading human life into animal life, can we wonder that reputable psychologists who have critically studied animals insist that such writings are essentially fiction? Obviously they are not contributions to science. True the book contains plenty of well known facts; but it is primarily a book of interpretations and in making these the free play of a good imagination has woven the facts into the fictions of the "human side" of animal life.

Another similar book recently published is "Wayeeses, the White Wolf," by W. J. Long. It is an extract from "Northern Trails." The accuracy

of certain statements have been called in question; but accepting the statements as they stand, we must recognize that the author in his characteristic style has read human life into his animal heroes. The remarks above apply here also.

In conclusion, the criticisms above must not be taken as meaning condemnation of such books. The reviewer, who writes from the standpoint of a critical man of science, believes that such animal fiction has an important place, not in science, but in literature. The moral value of such books is great, but they should be read with the spirit and the understanding which even children soon learn to apply to ordinary fiction.

THE AMERICAN NATURE-STUDY SOCIETY

The Organization Committee has voted to call a meeting of all persons interested in the formation of the Nature-Study Society, to be held at the University of Chicago, on Thursday, January 2nd. The main purpose of that meeting will be the discussion of plans for organization and for future work of the Society. Fuller details will be given in the next issue of THE REVIEW. That issue will also contain the proposed constitution for the Society and the nominations suggested by the Organizing Committee. One article of the proposed constitution provides that nominations shall be made annually by the Council (consisting of the usual officers and ten or more directors), and also that any name receiving the nomination of fifty members shall be added to the list of nominations. This will insure proper representation for State and local branches of the Society. The proposed constitution also provides that members not able to attend meetings shall have the right to vote by mail.

The meeting of the American Association for the Advancement of Science will be held at the University of Chicago in the week beginning December 30th. A circular giving full information concerning hotels, railroad rates (practically two cents per mile each way), and meetings of the various scientific societies may be obtained from Dr. L. O. Howard, Permanent Secretary of the American Association for the Advancement of Science, Washington, D. C.

M. A. BIGELOW,
Secretary of Organizing Committee.

NATURE-STUDY AND SCIENCE NOTES

[EDITOR'S NOTE—This department will be conducted by Chester A. Mathewson, of the High School of Commerce, New York City. Notes and suggestions may be sent to him in care of the editor of THE REVIEW.]

Nature in Literature. It is proposed that for the year 1908 a page be reserved for quotations from the best and greatest nature literature. There are many good things in this line which we forget because we rarely see them in print. Readers are requested to make suggestions regarding selections. As far as possible send *accurate copy from original editions* and give full references. No quotation may exceed 300 words. We prefer the short ones. Please make a memorandum of this note so that you will not forget to send your own selections.

M. A. B.

Cotton Boll Weevil. A circular issued this month by the Government cites an important step in the control of the cotton boll weevil. Experimental tests have demonstrated that if the cotton plants are uprooted and burned during the early fall, the weevils fail to appear the following spring. This destruction stops the development of weevils that would normally hibernate successfully, and reduces many fold the number of weevils that would otherwise emerge in the Spring to damage the cotton. Furthermore, the clearing of the field in the fall makes fall plowing possible, thus reducing still further the number of places for shelter left for the ubiquitous weevil.

The Rat is characterized in a recent circular from the Department of Agriculture as the worst mammalian pest in existence. The common brown or Norway rat reached this country in 1775 and ever since has been levying heavy tribute for its maintenance, the average cost of the grain consumed by every rat being about fifty cents per year. They destroy not only food, but curtains, carpets, silks and woolens, kid gloves and leather goods of all sorts. They gnaw through lead pipes, eat insulation from electric wires, and gnaw at the foundations of buildings, thus causing indirectly many millions of dollars damage.

The chief obstacle to their extermination is their prolificness. A single pair breeding without check and without losses by death would be represented in about three years by 20,000,000 individuals. Various sporadic attempts have been made to check the ravages of these rodents, but so far no adequate means of effectively combatting them has been devised. Cooperative effort of an entire community is the only means that has accomplished much thus far.

"How to Study the Animals at the Zoological Garden" is the title of a useful pamphlet written by Professor M. F. Guyer of the University of Cincinnati. It contains definite suggestions designed to show the teacher how he may get some real results from the visits of classes to a zoological park. Too often such visits, owing to the lack of a definite aim and method, are

quite profitless to the class which spends its time in an aimless and cursory examination of the collections of animals.

Hybrid Mints. The *Plant World* for June states that a French botanist, Malvinand, has made a special study of the hybrid mints found in his country. The results show that these plants hybridize constantly, crosses being found in great numbers. These hybrids however, are quite incapable of perpetuating themselves as new races, for the results of any single cross survive for only a few generations.

Bugs and Bank Panics. In a recent address, President William Dutcher of the National Association of Audubon Societies made the statement that "bugs cost more than a panic." Insect pests destroy $800,000,000 of the nation's agricultural wealth annually. The proper protection of birds which feed on such pests would save to the country an amount equal to the entire capitalization of its national banks. Mr. Dutcher called attention to the fact that if a million or more dollars are lost through the mismanagement of a bank or other fiduciary institution, it creates a wave of protest throughout the country; yet the enormous loss mentioned above creates no comment because the public does not realize what is going on.

The rate of decrease in the number of birds in the United States is very high, not to say alarming. Statistical studies show that at the present time the number of birds is forty percent. less than it was fifteen years ago. The highest percentage of slaughter is recorded in Florida where the decrease has been seventy percent. in fifteen years.

Dwarf Fruit Trees. In the *Garden Magazine* for October is an account of a recent and striking advance in horticulture in the production of fruit on dwarf trees. By the use of these trees fifty may be grown in the space ordinarily allotted to one. The advantages of the dwarf are (1) they require much less room than standards, thus enabling one to grow all the different kinds in a back yard; (2) they come into bearing from two to five years earlier than standards, often bearing a crop worth considering the second or third year; (3) one can care for them much more conveniently and thoroughly, thus avoiding insect pests; (4) if they are not put close together, they will not shade the ground too much for strawberries and other vegetables.

Dwarf apples are budded on a small-fruited, wild European apple called the paradise. Dwarf pears are budded on quince stocks. There are also dwarf peaches, plums, etc., the best method for producing which has not as yet been fully worked out.

A New Window Garden. "I have a new sort of window garden in my office. I am experimenting with common things to see how they will do. Thus far I have had good results. I have planted the following: Common asparagus which is now between five and six feet high and in full bloom. Tiger-lilies that are as vigorous as any I ever saw out of doors. These are over a foot high. I think they will be in blossom in a month or less. Blood-root which is about ready to blossom. Jacob's ladder which is a mass of leaves at present. A strawberry plant and a few ferns. These have been planted about a month. I dug them up late in the autumn and

put them in a cool place in the cellar where they kept moist. This is only a suggestion of the possibilities along this line as to the variety of common things that could be utilized for a school garden in winter at a small expense." [From a letter by Supt. L. A. Hatch, DeKalb, Ill., Feb. 2, 1907.]

Health Rules for Children. "Responsibility of Teachers for the Health of their Children," is the title of a recent number of the Hampton Leaflets. It contains a brief and practical summary of the points which every teacher should have in mind if she wishes to safeguard the health of young children. The following are examples of the rules for school children: Do not put pencils, money, pins or anything into the mouth except food and drink. Do not swap apple cores, candy, chewing gum, half eaten food, whistles, bean blowers or anything that is put into the mouth.

Time spent in the care of the body brings quick and great returns. The instruction in regard to health which a teacher can give her pupils secures to them that strength and ability to apply their forces, without which all other teaching falls far short of its aim.

Ether and Strawberries. A French experimenter has shown that strawberry plants subjected to ether before flowering will flower earlier and bear more fruit. It is well known that ether will force certain greenhouse plants into forming flowers early.

Agricultural Aspect of Primary Education. "Nature-study and elementary agriculture are subjects which must be taught in harmonious relationship to systematically encourage the habit of accurate observation—to vitalize the mental and reasoning powers of the child. All animate nature appeals to children when directed to it in a sympathetic and attractive form. By this early awakening we stimulate and bring into existence the child's love for country life and its avocations. Shakespeare reminds us there are "tongues in trees, books in the running brooks, sermons in stones, and good in everything." In your hands lies the power to create a lasting public sentiment and respect for farming operations, and thus become an unseen influence in our national prosperity. Professor C. Lloyd Morgan, the principal of University College, Bristol, stated in a recent paper on "Nature-study in Elementary Education":—"I am so fully convinced of the supreme importance of training the faculties of observation and the habit of sensory alertness in the early plastic and impressionable period of childhood—I hold so strongly the belief in the desirability of cultivating the sensory memory and storing the mind with faithful images of natural objects and scenes—that I am disposed to claim for nature-study a foremost place in the early stages of the education of all." What are we to understand by nature-study? "A process by which simple natural objects acquire meaning." We may assuredly assume that nature-study is the outcome of object teaching, the gradual growth of mental faculty, and the displacement of the old and detestable, mechanical memory method. It directs a child's mind towards the importance of the instructive love and study of nature. The principle of utility is effectually insinuated at this stage, and lends strength to a subsequent feeling of contentment with outdoor studies and pursuits.

Nature-study should not be associated with the systematic teaching of agriculture beyond the understanding of basic facts and principles of an elementary character. These govern and control agriculture. Subjects may be selected for nature-study which have direct bearing on the every-day life and occupations of a farmer. Fruit trees, vegetables, food plants, the injurious or beneficial insects and birds, the domestic animals, the seasons, can all be drawn upon. Bailey, states "Every subject in which men are interested can be put into pedagogic form, and be a means of training the mind."

It is not desirable or intended to teach the various operations associated with agriculture in our public schools. The aim is to interest the child in subjects intimately connected with daily home and farm life, to direct the child's mind to them attractively, to lay the foundation of future training either on the farm or in the agricultural college, to unfold natural science and demonstrate its usefulness in its later application to the land, to supersede the distasteful and wearisome burdens of antiquated methods on the farm. The affairs of common life are now so intermixed with applied science that our teachers in country schools should in the best interests of their pupils be in constant and practical sympathy with this form of teaching." [Notes from an address by H. W. Potts, Principal of the Hawkesbury Agricultural College, Australia.]

Bumble-Bees for Phillipines. A consignment of these insects has been sent by the Department of Agriculture. They are needed to pollinate the red clover which is being introduced.

New Bird Reservations. In August, President Roosevelt ordered a new reservation for protection of native birds at the mouths of the Mississippi. [*Bird-Lore.*]

Starlings. In *Bird-Lore* for October our new bird citizen, the European Starling, receives much attention from bird students, who are noting with concern its rapid spread from the original point of introduction in New York City. Already the bird is believed to be beyond control, and the question arises whether we have not here another English-Sparrow problem on our hands.

Equine and Canine Meat. There were slaughtered and consumed in Germany during the year 1906, 182,000 horses and 7,000 dogs. In Saxony alone, which embraces one-thirty-sixth of the area, and one-thirteenth of the population of the Empire, 12,922 horses and 3,736 dogs were butchered. These numbers represent the animals merely that passed official inspection. There is an enormous amount of illegal, unregistered slaughtering being carried on. The traffic is on the increase. The 182,000 horses slaughtered in 1906, represented an increase over 1905 of 20,000, and over 1904 of 47,000. The increase in the consumption of dogs is correspondingly rapid. The German press gives full publicity to the traffic. Throughout the Empire, especially in the large cities, the newspapers advertise horseflesh delicacies (?) as freely as they do the old-fashioned delicatessen. Dog-flesh is not quite so widely advertised, although it is not wholly neglected by the clever advertiser's art. [*Good Health.*]

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RENEWAL OF SUBSCRIPTIONS

Very many subscriptions expire with this issue. The time for which payment had been received on Dec. 5th is shown by the address-label on the wrapper.

$1.00 for 1908 if paid in advance ; $1.20 if payment is delayed over two months.

The publisher is forced to ask for payment for 1908 before March, because the Postoffice does not allow a large number of unpaid subscriptions on the mailing list. According to the proposed law, which will probably be enacted soon, names cannot be carried over four months unpaid, unless the publisher pays a higher postage rate. This and other expense forces the price to $1.20 when payment is delayed.

The slips enclosed may be used for new or renewal subscriptions. If you wish to be credited with dues to American Nature-Study Society write on the slip "Credit to 1908 dues of A. N. S. S." Dues to the Society will be payable before Feb. 1. All remittances sent direct to THE REVIEW will be reported to the Treasurer of the Society.

The REVIEW will not be sent continuously unless so ordered. A postal card order to continue will keep your name on mailing list, subject to above rule regarding delayed payment.

THE
NATURE-STUDY REVIEW

DEVOTED TO ALL PHASES OF NATURE-STUDY IN SCHOOLS

VOL. 3 DECEMBER, 1907 NO. 9

THE NATURE-STUDY POINT OF VIEW IN TEACHING AGRICULTURE

By L. H. BAILEY

Cornell University

A fundamental necessity to successful living is to be in sympathy with the nature-environment in which one is placed. This sympathy is born of good knowledge of the objects and phenomena in the environment. The process of acquiring this knowledge and of arriving at this sympathy is now popularly called nature-study.

The nature-study process and point of view should be a part of the work of all schools, because schools train persons to live. Particularly should it be a part of rural schools, because the nature-environment is the controlling condition for all persons who live on the land. There is no effective living in the open country unless the mind is sensitive to the objects and phenomena of the open country; and no thoroughly good farming is possible without this same knowledge and outlook. Good farmers are good naturalists.

For many years it has been one of the purposes of the College of Agriculture in New York to point the way to this nature-sympathy; and inasmuch as this nature-sympathy is fundamental to all good farming, it was conceived that the first duty of any movement was to lend the effort to the establishing of an intelligent interest in the whole environment—to knowledge of fields and weather, trees, birds, fish, frogs, soils, domestic animals. It would be incorrect to begin first with the specific agricultural phases of the environment, for the agricultural phase (as any other special phase) needs a foundation and a base: it is only one part of a point of view. Moreover, to begin with a discussion of

the so-called "useful" or "practical" objects, as many advise, would be to teach falsely, for, as these objects are only part of the environment, to single them out and neglect the other subjects would result in a partial and untrue outlook to nature; in fact, it is just this partial and prejudiced outlook that we need to correct.

In our own work, we have always had in view the agricultural aim or application. We should have been glad if there had been sufficient nature-study sentiment to have enabled us to confine ourselves to the agricultural aim; but this sentiment had to be created or quickened, and we have tried to contribute our part toward accomplishing this result. At first it was impossible to secure much hearing for the agricultural subjects. Year by year such hearing has been more readily given, and the work has been turned in this direction as rapidly as the conditions would admit, for it is the special mission of an agricultural college to extend the agricultural applications of nature-study. In later years the content of the work has had very direct relation to farm-life questions. The time has now come, we think, when we can devote practically all our energies to this application; and we therefore discontinue the *Junior Naturalist Monthly* and issue the *Cornell Rural School Leaflet*. It is the purpose of this Leaflet to aid the teacher in the rural school to work out the practical daily problem of teaching agricultural subjects.

In doing this, we merely confine ourselves to our more special field. The general nature-study outlook is fundamental, and we shall continue to emphasize it; but we feel that the appreciation of this outlook is now so well established as to allow us to specialize. The State Education Department has issued syllabi for agriculture and nature-study; we desire to be useful in applying them to the conditions and needs of country life. Schools here and there are ready for agricultural work: we want to help.

In making these statements we have it in mind that the common schools do not teach trades and professions. We do not approach the subject primarily from an occupational point of view, but from the educational and spiritual; that is, the man should know his work and his environment. The mere giving of information about agricultural objects and practices can have very little good result with children. The spirit is worth more than the letter. Some of the hard and dry tracts on farming would only add one more task to the teacher and the pupil if they

were introduced to the school, making the new subject in time as distasteful as arithmetic and grammar often are. In this new agricultural work we need to be exceedingly careful that we do not go too far, and that we do not lose our sense of relationships and values. Introducing the word agriculture into the scheme of studies means very little; what is taught, and particularly how it is taught, is of the greatest moment. We hope that no country-life teaching will be so narrow as to put only technical farm subjects before the pupil.

We need also to be careful not to introduce subjects merely because practical grown-up farmers think that the subjects are useful and therefore should be taught. Farming is one thing and teaching is another. What appeals to the man may not appeal to the child. What is most useful to the man may or may not be most useful in training the mind of a pupil in school. The teacher, as well as the farmer, must always be consulted in respect to the content and the method of teaching agricultural subjects. We must always be alert to see that the work has living interest to the pupil, rather than to grown-ups, and to be on guard that it does not become lifeless. Probably the greatest mistake that any teacher makes is in supposing that what is interesting to him is therefore interesting to his pupils.

All agricultural subjects must be taught by the nature-study method, which is: to see accurately; to reason correctly from what is seen; to establish a bond of sympathy with the object or phenomenon that is studied. One cannot see accurately unless one has the object itself. If the pupil studies corn, he should have corn in his hands and he should make his own observations and draw his own conclusions; if he studies cows, he should make his observations on cows and not on what some one has said about cows. So far as possible, all nature-study work should be conducted in the open, where the objects are. If specimens are needed, let the pupils collect them. See that observations are made on the crops in the field as well as on the specimens. Nature-study is an out-door process: the schoolroom should be merely an adjunct to the out-of-doors, rather than the out-of-doors an adjunct to the schoolroom, as it is at present.

A laboratory of living things is a necessary part of the best nature-study work. It is customary to call this laboratory a school-garden. We need to distinguish three types of school-

garden: (1) The ornamented or planted grounds; this should be a part of every school enterprise, for the premises should be attractive to pupils and they should stand as an example in the community. (2) The formal plat-garden, in which a variety of plants is grown and the pupils are taught the usual handicraft; this is the prevailing kind of school-gardening. (3) The problem-garden, in which certain specific questions are to be studied, in much the spirit that problems are studied in the indoor laboratories; these are little known at present, but their number will increase as school work develops in efficiency; in rural districts, for example, such direct problems as the rust of beans, the blight of potatoes, the testing of varieties of oats, the study of species of grasses, the observation of effect of fertilizers, may well be undertaken when conditions are favorable, and it will matter very little whether the area has the ordinary "garden" appearance. In time, ample grounds will be as much a part of a school as the buildings or seats now are. Some of the school-gardening work may be done at the homes of the pupils, and in many cases this is the only kind that is now possible; but the farther removed the laboratory the less direct the teaching.

To introduce agriculture into any elementary rural school it is first necessary to have a willing teacher. The trustees should be able to settle this point. The second step is to begin to study the commonest and most available object concerning which the teacher has any kind of knowledge. The third step is to begin to connect or organize these observations into a method or system. This simple beginning made, the work ought to grow. It may or may not be necessary to organize a special class in agriculture; the geography, arithmetic, reading, manual training, nature-study and other work may be modified or re-directed. It is possible to teach the state elementary syllabus in such a way as to give a good agricultural training.

In the high school, the teacher should be well trained in some special line of science; and if he has had a course in a college of agriculture he should be much better adapted to the work. Here the teaching may partake somewhat more of the laboratory method, although it is possible that our insistence on formal laboratory work in both schools and colleges has been carried too far. In the high school, a separate and special class in agriculture

would better be organized; and the high school syllabus of the State Education Department provides for this.

In all agricultural work in the schools of the State, the College of Agriculture of Cornell University desires to render all the aid it can. Correspondence is invited on the agricultural questions involved. In special cases an officer of the College may be sent to give advice on the technical agricultural phases of the teaching. Considerable literature in the publications of the College is now available and will be sent on application.

In many districts the sentiment for agricultural work in the schools will develop very slowly. Usually, however, there is one person in the community who is alive to the importance of these new questions. If this person has tact and persistence, he ought to be able to get something started. Here is an opportunity for the young farmer to exert influence and to develop leadership. He should not be impatient if results seem to come slowly. The work is new; it is best that it grow slowly and quietly and prove itself as it goes. Through the grange, reading-club, fruit-growers' society, creamery association, or other organzation the sentiment may be encouraged and formulated; a teacher may also be secured who is in sympathy with making the school a real expression of the affairs of the community; the school premises may be put in order and made effective; now and then the pupils may be taken to good farms and be given instruction by the farmer himself; good farmers may be called to the schoolhouse now and then to explain how they raise potatoes or produce good milk. A very small start will grow by accretion if the persons who are interested in it do not lose heart, and in five years everyone will be astonished at the progress that has been made. [Prefatory note, *Cornell Rural School Leaflet*, Vol. I, No. 1, Sept., 1907.]

THE CRITERIA OF SELECTION OF MATERIAL FOR THE TEACHING OF NATURE-STUDY AND GEOGRAPHY

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[Read at meeting of Northern Illinois Teachers' Association, Nov. 2, 1907.]

The form of statement of the topic of this discussion may be presumed to suggest either that the fields of nature-study and geography are essentially one and have the same criteria when used in education, or that between the fields and criteria of these subjects there should be recognized more sharply defined distinctions. In approaching this topic, therefore, it becomes necessary first to consider the question of the unity of nature-study and geography. It is also necessary that this consideration be from the point of view of the instrumentality in educational processes of nature-study and geography, and not from the point of view of the special sciences that are involved.

I. Unity of Nature-Study and Geography

The nature experiences of the younger children—those below school age and to the end of the third or even the fourth regular school year—are those that have to do almost entirely with the immediate environment. These earlier immediate nature experiences are somewhat isolated and unorganized in the child's mind. Such relationships as exist are of the position or associations of things when observed or experienced, not of their position in any scheme of scientific arrangement. The interest of younger children in natural phenomena is an interest in things, not an interest in systems of arrangement of things. They ask many specific and but few general questions about any one or a number of the natural phenomena with which they are associated. "What is it?" "What is it for?" "How does it do it?" and "Isn't it beautiful?" include the questions almost universally asked by children when they face a new object. These fundamental questions are the ones with which the human race doubtless began its process of a more accurate adaptation to its natural environment and are the ones with which that process has been

continued. It is through answers to these questions in some of their many forms that we have secured modern adjustments to nature, an appreciation of nature uninfluenced by man, and of nature as transformable better to contribute to the needs of man. They are fundamental questions in education. They appear in a simple form in early nature-study, but later are differentiated into those complex questions which lead us to an appreciation of formal science.

Young children constitute a group of inquirers about whom are gathered all those myriads of things, the total of which is the nature environment. They seek first to know individual or closely grouped phenomena. In a few years they become more interested in relating these phenomena to themselves and appropriating them to their own uses. This first study is distinctly one of orientation of oneself relative to his nature surroundings, a study of places and things. Nature, to a young child, is largely an unorganized unknown but it is the "unknowness" that the child first recognizes and attempts to remove, and not the "unorganizedness."

Out of this condition there gradually differentiates a tendency toward a grouping of the observed nature phenomena. Some of these phenomena are grouped directly about the earth interests of man, and in this we have the beginning of geography. Other phenomena begin to be grouped less directly about man's industrial and social life, but more closely about the interests of things themselves. The phenomena of hills and valleys begin to be thought of with reference to the present, past, and future of hills and valleys, with reference to their influence upon life in general, and not primarily with reference to use as homes for men. Plants and animals begin to be thought of as having structures, habits, and homes as related to their needs and processes as plants and animals, not primarily as taking from or adding to man's well-being. With the beginning of this sort of recognition of nature, we may properly have the branching of geography from the common stalk of nature-study. The branch, no matter how extensive or spreading it may become, maintains its connection with the nature-study tree. The subdivisions of the branch must become somewhat interwoven with one another, with other branches from the tree, and with branches from other trees.

In the early period in the child's education nature is a mass of

more or less interesting materials with which the child is becoming acquainted. Acquaintance with particular not general features of nature is the child's purpose in so far as he has a purpose. When the period arises during which nature may be studied primarily as a home for man, as well as made up of things and processes of intrinsic interest, the spirit of acquaintance with nature which characterizes the first period is not lost, but is enlarged and given a new field for development. Similarly near the close of the grammar-school period, when whatever was left of nature-study after geography branched from it divides into zoology, botany, physiology, physics, chemistry, geology, physiography and astronomy, there continues to be carried into these fields the desire for acquaintanceship found in the first period, the desire for knowledge of relationship to men which is found in geography, and the desire for knowledge of special nature problems which is found in nature-study. All of these desires are present to some extent with the desire for knowledge of the separate sciences.

It is evident that there can be no closely drawn line between the periods cited above, since one period gradually develops into the succeeding one. Any statement as to the age of children or school grade in which the oneness of nature become differentiated into geography and other nature studies, must be somewhat arbitrary. In actual practice it would seem that recognizing this differentiation at the end of the third regular school, or possibly at the end of the fourth year, would best meet the average of conditions. It seems necessary that there be a better recognition of the unity of nature-study and geography in the lower grades of school work and of the constant and necessary overlaping of these subjects in succeeding grades. Failure to recognize these things must result in much confusion and duplication of effort. If geography is "The Study of the Earth and its Inhabitants," it is somewhat difficult to discover a field of nature-study outside the boundaries of geography, and it would be better to leave the organization of nature-study to those who are responsible for the teaching of geography. If geography deals with those features of nature that have to do directly with the earth as a home for man, it represents one point of view of nature and should not determine the arrangement of nature materials that are undifferentiated as to special sciences. It becomes

highly important that sufficient study be given this question in order that usable limits of these subjects may be found. If there are not usable limits, a readjustment of our terminology of subjects and reduction of the number of fields of our efforts, will contribute to economy of time and definiteness of results. The general inter-relationships of knowledge are such as to make it possible for an enthusiast in any subject to organize all knowledge about his subject. In general education, however, we must recognize boundaries, as natural as may be discovered, but always more or less arbitrary.

II. Mental Attitude Toward Nature

In discussing the unity of nature-study and geography considerable was said regarding the learner's attitude toward nature, consequently this statement may be brief. Practically all children have an attitude of inquiry toward nature. Often, it is true, this is little more than a slightly intelligent curiosity. It is an inquiry born of a desire to be acquainted with things that are about us. Questions as to what things are and what they are for, are constantly forthcoming from young children. In a few years there comes to be added to this acquaintanceship inquiry, a notion that structures and habits are of some use to the organisms possessing them, and also that many of these structures and habits bear a definite relation to man in that they contribute to his profit or pleasure, or take from those things. The obvious approach to nature, therefore, from the point of view of the younger children's interests is through the inherent spirit of inquiry into the natural phenomena of the immediate environment. This inquiry first relates to what things are, and secondly to their functions and processes. When notions of function come to be appreciated, the learner soon discovers that function may relate to the object itself as observed in nature, or in a distinctly different way function may relate to man, and he differentiates a study of nature interests as related to man. In the study of this field, therefore, the point of view calls for selection of those materials that have had to do with man's progress and those that are now usable by him. At a later period, toward the end of the grammar school or even early in the high school, the attitude may have become that which appreciates and attempts to make an orderly arrangement of materials such as is involved in the study

of the separate sciences, and hence this new attitude must be recognized in deciding upon a logical selection and presentation of materials.

The above statement seems to be essentially true as to the general attitude toward nature of average children, but it must be recognized that in any given group of children of the same age and same grade of advancement, different individuals will hold in mind quite different values as determining their interest. Nature-study critics sometimes attempt to determine whether children's interests are in those phases of nature that are educational, aesthetic, economic and industrial, or ethical and religious, and doubtless if we could but find the truth we should find some of these values more nearly universal with children than are others. In determining the general attitude toward nature, however, we find that it is not reducible to any single value. For example, it has been suggested that in the study of the topic "water" one pupil, an older daughter of a washer-woman, sees most prominently its relation to solutions and cleansing power; another who is interested in machines sees its relation to steam and propelling force; one who is beginning to be interested in chemistry thinks of the water's H-2-Oness; the agriculturally inclined think of its relation to plant and animal life; to another the conspicuous thing is its buoyancy by means of which it carries great vessels from land to land, and by which buoyancy and movement it sometimes dashes them against the rocks; another thinks of its power of work in wearing down continents and in filling the seas; others think of related pleasures, swimming boating and skating; others think of the beauty and majesty of bodies of water. It is obvious that the interests are too diverse to be gathered under any one of the five headings given above, and any organization or selection of material and any method of treatment to be used must be sufficiently plastic to permit expression of these individualities in attitude.

III. The Educational Purposes of Nature-Study

In so far as the purposes of nature-study and geography are common the following statement will stand for both, but no attempt has been made to make a statement particularly for geography.

The general educational purposes of nature-study seem to me

to be: 1. To stimulate and extend inherent inquiry into nature. 2. So to direct the processes of inquiry that the results may be definite and trustworthy. 3. To direct inquiry toward those phenomena which, while serving best to stimulate inquiry and to develop proper thought processes, will give enjoyment and useful and interesting knowledge about nature.

1. The first of these purposes recognizes the nature interests already enjoyed and calls for new and attractive related interests which will become new problems. The kind of relation of the pupil to the new problem is not necessarily a subject-matter relationship, but a relation to the pupil's previous experience. To stimulate interest the new material must contain some sort of appeal to the pupil. If it does not, and if no appeal to him can be developed, the first purpose of nature-study fails. The inquiring mind is not fostered, but killed, by having loaded upon it data concerning which it has no questions, out of which no problem is made. Even the simplest form of nature-study question asked by youngest children, 'what is it?" is a true nature-study problem to which may easily be added the more intricate problems of "Why?" and "How?" The materials to be presented by means of which we hope to stimulate and develop inquiry must be so selected and related to surroundings and experience and so presented that pupils will care to ask "What?" and "Why?" and "How?" Failure to present such material in such a way, or substitution of materials not legitimate in nature-study kills native inquiry.

2. If the processes of inquiry are not so directed that the results are reasonable trustworthy, the first purpose can be met but poorly, and indeed is scarcely worth meeting. True inquiry involves care as to the validity of the results of the inquiry. Not very much can be done in establishing a spirit of wanting to know about nature unless there has been some experience in getting at some really accurate, though possibly general, knowledge of nature. One of the greatest obstacles to be overcome in establishing a good system of nature-study teaching is to be found in the failure to raise to its true importance the necessity of having the results of inquiry just as accurate as the phenomena observed make possible. Inquiry has so frequently met fictitious answers that the inquirer has lost the spirit of inquiry. An unanswered query still lives. A fictitiously answered query, if alive, is mutilated.

Nature-study offers a most excellent opportunity for developing safe and economic methods of solving problems. With materials before him it is possible for the pupil to be held to see that his conclusions must be securely based upon his data. Great care should be exercised in seeing that materials at hand are used fully in establishing those conclusions that are justified, and further that they are used in a suggestive and imaginative way to forecast conclusions that cannot be fully determined, but may serve as problems for future observations. There is a prominent place for the nature-study imagination, but it is regulated by the truths of nature and must not be allowed to distort possibility, or lead into guessing contests concerning things of which we have no trustworthy data.

I realize that there are those who do not believe that this point of demanding thoroughly accurate observations and fully justifiable conclusions is well taken. Some believe rather that children should merely be exposed to nature and allowed to combine with it or be neutral to it as may be. Surely none of us would argue for that complete and orderly observation and series of judgments in any given field such as would enable children to classify those data and judgments as a science. Such attempts have often killed the nature-study spirit. If, on the other hand, the sensitive plates of the child's mind receive exposure only and no development, how can we hope to secure nature pictures that have any setting, any relation to one another, or that are any more indeed than befogged plates exposed several times and now for this purpose uninteresting and useless? Somewhere between these two points of view the truth lies. In younger children the mere exposure point of view predominates, but at least some assimilation of materials must be made even here. In older children exposure is no less used; but development, and quality and quantity and scope of judgment must be extended.

3. The third general purpose here recognized is to direct inquiry toward those phenomena which, while best stimulating inquiry and best serving to develop proper thought processes, will give enjoyment and useful and interesting knowledge about nature.

The enjoyment aspect of nature-study must be given prominent position. It may be no more than the pleasure of being out of doors or in company with rocks and hills and plants and animals.

It may be the enjoyment of the beauty of the creatures of the living and lifeless worlds. It may be the enjoyment of a wider speaking acquaintance with nature and of knowing more, just for the sake of knowing. It may be enjoyment found in solving the problems nature presents. It may be the pleasure that comes through possession of useful knowledge and of a feeling of mastery over those things that are of utility to men. Much of the nature material used should be selected primarily because it offers opportunities for new pleasures, it being known by the teacher that to truly enjoyable work many values other than pleasure may be added.

Nature-study materials should also make possible a large body of knowledge that is useful in the broadest sense of that term; knowledge of the domesticated animals, their ways of living, their use by man, their histories, the selection and care of the best breeds, the regions where different ones thrive best; knowledge of house pets; of wild animals, their relation to one another and to man; of helpful and injurious insects; knowledge of domesticated plants, house plants, vegetables and flowering plants and the gardens in which they grow, agricultural plants, orchard plants, nut and fruit trees of the wood, lumber and its sources and uses, poisonous, medicinal and fibre plants; plants and animals and climatic conditions as soil makers; building stone, brick, lime, sand; minerals, coal gas, oil; knowledge of factors having to do with public and private health; knowledge of physical forces, of simple machines, of the applications of electricity; of the transformations of chemistry and their uses in industrial and household processes.

These and many other possible topics suggest the array of useful nature knowledge. Such nature material is quite as adaptable as any other in developing the three general purposes mentioned above, and is of much importance in making pupils potent factors in the intellectual and social life in which they may find themselves. It is not to be inferred, however, that interest in even a broadly utilitarian aspect of nature is to supplant interest in things themselves. Interest in physical and chemical forces as such, in what plants and animals are and how they meet their own life needs, in how earth contours came to be and in what they are going to be are more enduringly fascinating to one truly engaged in nature-study than are the uses man may make of these things.

"BOOMING" NATURE-STUDY

By M. A. BIGELOW

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Several recent letters have expressed the opinion that the organization of the Nature-Study Society will "boom" nature-study. Let us hope that it will not. "Booms" in the business world are due to purely artificial stimulation and not to natural growth. They are mushrooms both in rapid development and in ephemeral existence. No, we want no "booms" in the nature-study movement. In fact we have had too many already—so many that in certain quarters there is a decided prejudice against nature-study. And we have had other "booms" in school work, e. g., vertical penmanship and "physiology." The advocates of nature-study should not try to repeat such history.

The proposed constitution of the American Nature-Study Society reads as follows in Article 1: "The objects of the American Nature-Study Society are, by publications and by national and by local meetings, (1) to promote critical investigation of all phases of nature-study (including all studies of nature for elementary schools); and (2) to work for the establishment in schools of such nature-study as has been demonstrated valuable for elementary education." This does not suggest "booming" nature-study. On the contrary, it suggests that the Society is dominated by a group of conservative students of education who recognize that nature-study still has problems—very serious ones—which must be settled before sure progress can be made; and also it definitely disclaims any intention of pushing any phase of nature-study before its educational values and practicability are on a sure basis.

The new society should not adopt the methods of the "nature-study enthusiasts" who sometimes forget to take a well-balanced view of things. We who are naturalists in vocation or avocation must remember that, after all, naturalists represent comparatively a rare variety of the human genus, and our own outlook on the world may be quite unintelligible to a large majority of our intelligent fellow men. We must, therefore, move carefully and not attempt to force our own views of things upon those not

prepared to understand. There must be a foundation, a preparation. Here is the work for the Nature-Study Society.

And even after preparation let there be no forcing of the nature-study movement. Let us hope that the Nature-Study Society will never attempt to establish nature-study in any of its phases by legislation making the study compulsory. Laws may be short cuts to quick results in some things; but we all know the deplorable results in the case of physiology, we are beginning to feel doubtful about the ultimate results in certain States requiring "humane education" (another name for the ethical side of nature-study), and there are signs that the recent legal enactments concerning "elementary agriculture" are forcing a too sudden expansion of the agricultural teaching, rather than stimulating a natural, healthy growth.

Such considerations as the foregoing should make nature-study advocates cautious about "booming" nature-study; and should lead to careful, solid work at the bottom. These are the days when the firm foundations of nature-study may be laid; but a really stable superstructure must be the outcome of work which certainly the present generation of teachers and pupils can not complete. And this is so because the only hope that the masses of even intelligent citizens will come to appreciate the naturalist's outlook lies in surely influencing the successively rising generations.

Then let us cease to speak of nature-study workers as "enthusiasts," a term which too often suggests narrow, imaginative, radical, visionary, not to say fanatical persons. The "glory-halleluiah brass-band" methods of "enthusiasts" in other lines might "boom" nature-study for a short time; but the future of the movement depends upon steady, conservative work giving unquestionable results and solid growth.

SOME PRINCIPLES THAT DETERMINE THE SCOPE OF NATURE-STUDY

By EDWIN A. TURNER

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We have heard much of nature-study in the last few years. Those who have advocated its educational importance most strongly have not always had the clearest conception of the growth that it should stimulate or a conclusive knowledge of the material that it should include. Intense enthusiasm has often been more prominent than reflection and the result is that there is a general belief that nature-study as a subject exists, yet there is no definite knowledge of its scope or even a tentative agreement as to the material that shall be used. Perhaps every distinct branch of study has had its inception in this vague way, but it was not worthy the name of a subject until the basic principles that are fundamental to its existence were determined and the scope which they establish was defined. It follows just as logically that if we are to make any claim for nature-study as a science the principles that define the scope of the subject must be determined before an intelligent selection of material can be made, or before the subject can have the dignity of some of our older and more closely organized subjects. The nature of the subject implies that these principles must be determined by the science of education rather than by the science of nature; that they must emanate from psychic laws and social needs rather than from natural laws.

It is interesting to note that our present nature-study is the outgrowth of two very diverse educational movements. The one had its rise in Rousseau and Pestalozzi, the other has grown out of the purely scientific spirit that has dominated our social life in the last half century. The former based its creed on nature and thereby attempted to teach the child to love nature by observing her varied and diverse forms. This movement gave an impetus to our present formal and largely sentimental nature-study. The latter has been responsible for much of our structural and life-history work. The one entered the elementary school from the kindergarten, the other came from the university down through

the high school. Neither has defined the scope by establishing principles for the selection of material. The one has laid stress upon faculty development, the other on the value of a disposition for scientific research.

More recently there has been an earnest effort to break away from former influences in an attempt to discover principles that are in touch with the educational advance of our time. The NATURE-STUDY REVIEW has been doing an admirable work in its effort to draw out and organize the best that has been felt in nature-study. It has set for its task to discover the scope of nature-study and thus distinguish it from elementary science. Many of its contributors in attempting to define the scope of nature-study are unable to get away from the influences of the original sources of the subject. Others use sound educational principles, but, as it seems to us, do not use all that are involved.

Professor John Coulter in setting forth the aim of nature-study states that it is to keep functional the "tentacles of inquiry" in the child. In the same number of THE REVIEW, Professor Bigelow says that "nature-study deals with the simple facts of nature as they are related to man's general interest in them."

These views considered together seem adequate to define the aim of nature-study. Either by itself is but half the truth. This must seem dogmatic, yet if it is the business of education to fit one to function as a social being, it means that not only the "tentacles of inquiry" be kept functional, but that the material selected shall prepare him to meet his obligations as a member of society. It is these phases that affect the intellectual and social life of the child's nature that must determine the scope of nature-study. The material chosen must answer these two questions: 1. Does it awaken a natural interest in the child? 2. Is it the most valuable in fitting the child for the social and industrial life that he is to live? These two questions lead us into vital problems of psychology and sociology.

We must resort to the nature of the child if we select material in harmony with this first principle. He is implusive—propulsive. He can not long hold his attention. It is constantly changing. If he is long to attend an object it must be changing. He responds to live things and active processes. The more active the things and processes the closer he will attend to them. This all means that the child's nature selects that which it would attend.

In the realm of classified knowledge this principle will select biology before chemistry or physics, either of these before the facts of geology or of astronomy. It means that animals shall precede plants; that physical elements shall come before chemical elements, and community life before that of the individual. This plan eliminates our formal and sentimental study. It deals with life processes, causes and adaptations, as well as mere physical activity.

But this principle will allow an abundance of material—more than we can ever use. Let us now apply our second principle (that which holds that nature-study shall fit the child to function efficiently as a member of society) to help us in a closer assortment. These principles in conjunction with each other will select material that either by itself might reject. The former would select the frog instead of the toad (because it is the more active,) while the two combined would choose the latter (because it more closely affects man's social and industrial life.) The former would select the squirrel in preference to the cat; combined they would choose the cat. By their combination the growth of seeds and buds would be chosen instead of the color and forms of leaves. All plant study would center about life processes and adaptations that are essential for the plant life that best meets man's physical, social, and intellectual needs. This would involve the study and cultivation of vegetables and house plants rather than a study of the names of wild flowers; the budding and grafting of fruit trees rather than the pressing of leaves or the collecting of woods. It would suggest an elementary study of electricity rather than an analysis of potassium chlorate; a study of fishes rather than the fresh water mussel; a study of the bumblebee in preference to the butterfly; a swarm of bees rather than a colony of ants; flies and mosquitoes rather than beetles and snails; roses, carnations and lilies instead of hepatica, marsh-marigold or chickweed the problem of cross-fertilization or the moving of sap rather than nature of bark or the form of twigs and leaves. These principles would not prevent one from using the most available material, but they would guide in the selection of the small portion of it that can be used.

Courses in nature-study, now generally in use, differ very widely from this view in their principles of selection. Availability seems to be the main criterion for selecting material, and even

this is disregarded by those intent on correlating it with geography and other subjects. Here space presents no obstacles. The ostrich of South Africa or the tiger of India are as readily used for subject matter as the robin or the toad. In general, as already stated, there are two types of nature students. The extreme of one is represented by the scientific degenerate; the extreme of the other by the sentimental enthusiast. Scientific degeneracy can best be illustrated by the following lesson plan taken from a course in nature-study in one of our larger Western cities:

"Plants—roots, stems, branches, buds, leaves, flowers, seeds. Cat—paws, claws, eyes, tongue, teeth, motion of jaw. Pig—hair, bristles, shape of head, snout; cloven foot, number of toes, tusk of wild boar."

Here are all the details of the scientist without any scientific attempt at correlation—without any thought of arriving inductively at some life principle, or acquiring a better knowledge of some improved methods of perfecting the usefulness of the organism.

The other type is nicely illustrated by a partial course taken from one of our larger Eastern cities: "Falling and color of leaves. Collect leaves and compare form and color. Observe habits of the cricket, grasshopper, squirrel, rabbit. Collect caterpillars and cocoons."

Other courses treat of the twigs of the elm, maple, pussy willow. They provide for the observation of the habits of birds, fishes and frogs; for collecting and mounting of the most interesting forms in the metamorphosis of some common animals. They provide for the keeping of bird calendars and weather charts. Here the emphasis is placed upon the marvelous and wonderful in nature, while ethical and esthetical inductions are lavishly made. This practice of arousing the emotions without affording an opportunity for definite motivation is a questionable practice. A modified form of the same practice is observed by those who learn the names of birds and flowers that they may talk about them. We have seen a well-known nature-study man make daily trips into the woods with a large class of elementary teachers. Each was ready with pencil and paper to jot down the names of this or that bird or butterfly as its name was glibly announced by the instructor. The entire party would become wild with

enthusiasm at the sight of a woodcock, cardinal or chewink in the brush. Doubtless this work has some value, but it will be hard to convince the wideawake public that it should be considered seriously. The trips in themselves are good, but they should throw light on real life problems. *Educator-Journal.*

OBSERVATIONS ON BARN-SWALLOWS

By BINA SEYMOUR

Wadleigh High School, New York City

The barn-swallows' nest observed was in the woodshed of a deserted farm-house at South Hadley, Mass. On August 7, when the observations were made, the nest contained only two young. At this time the birdlings were so large that they could easily have been mistaken for the parents. On the next and every succeeding morning they flew away from the nest, returning for the night. This day they chirped and twittered like the parents, frequently balanced themselves on the edge of the nest and fluttered their wings vigorously, picked at insects on the boards over their heads, and several times watched a wasp with keen interest as he crawled toward them.

Observations began at 4:30 A.M., thirteen minutes before sunrise, and closed at 7:30 P.M., thirteen minutes past sunset. At 4:30 other birds about the farm were awake and calling, but no sound was heard from the swallows until 5:03, when the stronger of the two birdlings stretched its wings and moved slightly in the nest. Again at 5:14, 5:20 and 5:25 this birdling fluttered its wings vigorously, chirped, perched upon the edge of the nest, then returned to its sleep in an altered position, as a child might turn in bed to finish its nap. The parents had not spent the night in the shed, nor did they return to it after the last feeding.

Feeding began at 6:03 A.M. and ended at 6:51 P.M.—making nearly a thirteen-hour day for the parents. During this time there were in all 332 feedings, distributed in time as shown by the table. The most rapid feeding was four times in one minute, at 11:50 A.M., the longest interval between feedings twenty-two minutes, 3:55—4:17 P.M., the next longest sixteen minutes, at three different times. The average timewas once in 2.31 minutes, and the average number of insects per birdling 166 for

the day. Almost without exception the birdlings were fed alternately, although we poor human beings were unable to discover how the parents knew whose turn came next. They even strenuously refused food to the stronger, who clamored most loudly and persistently "out of turn." Both parents shared the feeding and also the flying lessons which were given occasionally from 6:18 A.M.—2:43 P.M. By flying lesson I mean the following pretty little drama: one or both parents flew into the shed with the grace, swiftness and sound peculiar to swallows' flight, fed the young and circled about under the nest, then one perched on a beam and chirped coaxingly to the young, sometimes flying up to the nest and perching upon its edge while scolding and coaxing. The stronger of the nestlings invariably chirped and fluttered its wings during the process, but did not venture away from the nest.

During the hot, quiet hours of the afternoon, when the intervals between feeding were longest, the birdlings sometimes appeared to pant, keeping the bill slightly open; at other times they appeared to sleep, but sleeping or waking they immediately opened their bills wide and clamored for food upon the approach of the parent.

The swallows' nest had been an object of great interest to the temporary residents of the deserted farm-house from the day the wood-shed was chosen as a building site by the pair of swallows, but for the idea of a whole day's careful note taking I am indebted to the report by pupils of Dr. C. F. Hodge in the December, 1906, number of THE NATURE STUDY REVIEW. In noting observations I was assisted by Marjorie S. Watts of Springfield, Massachusetts.

Hr.	Time.	No. of feedings	Longest interval.	Greatest number per minute.
1	6:03— 7:03	13	6 min. at 6:32	1
2	7:03— 8:03	32	7 min. at 7:04	2 (4 times)
3	8:03— 9:03	28	10 min. at 8:25	2 (4 times)
4	9:03—10:03	28	16 min. at 8:59	3 (twice)
5	10:03—11:03	30	7 min. at 10:24	3
6	11:03—12:03	33	9 min. at 11:02	4
7	12:03— 1:03	27	12 min. at 12:25	3
8	1:03— 2:03	28	8 min. at 1:04	3
9	2:03— 3:03	34	10 min. at 2:49	3
10	3:03— 4:03	22	16 min. at 3:22	2 (4 times)
11	4:03— 5:03	18	22 min. at 3:55	2 (twice)
12	5:03— 6:03	20	16 min. at 5:43	2
13	6:03— 6:51	19	6 min. at 6:39 and 6:45	1
Total	12 hr. 48 min.	332		

AMERICAN NATURE-STUDY SOCIETY

The first meeting of the Society will be held in Room 159, Manual Training Building, 5820 Monroe Avenue, Chicago, Thursday, January 2, 1908, at 2 P. M. A series of short papers will discuss some fundamental problems of nature-study and the future work of the Society.

The meetings of the Association for the Advancement of Science and of the affiliated scientific societies begin on Monday, December 30, at the University of Chicago. Full information concerning these meetings may be obtained from Dr. L. O. Howard, Smithsonian Institution, Washington, D. C. These meetings bring together many who are interested in science teaching and therefore it has seemed advisable to hold the Nature-Study Society meeting at this time.

In order to get the suggestions of members, the proposed constitution is printed below. It will be discussed at the Chicago meeting. Send your suggestions to the Secretary of the Organizing Committee, who may be addressed at Teachers College, New York, until December 23, and after that in care of Prof. O. W. Caldwell, Dept. of Botany, The University of Chicago.

It has seemed to the Organizing Committee advisable to postpone making nominations for offices until after the proposed constitution is discussed at Chicago. Nominations and other matters to be submitted for general vote will probably be published in the January issue of THE REVIEW.

PROPOSED CONSTITUTION OF THE AMERICAN NATURE-STUDY SOCIETY

ARTICLE I—NAME AND OBJECTS

The objects of the American Nature-Study Society are, by publications and by national and local meetings: (1) to promote critical investigation of all phases of nature-study (including all studies of nature in elementary schools); and (2) to work for the establishment in schools of such nature-study as has been demonstrated valuable and practicable for elementary education.

ARTICLE II—MEMBERSHIP

The Society shall consist of members, fellows, and honorary fellows. Any person interested in any phase of nature-study or elementary science may become a member upon election by the

Council. A school or library may be enrolled as a member, and be represented at meetings by one of its officers. Fellows shall be elected by the Council from such of the members as have by publications, by teaching, or by administrative work made valuable contributions to the nature-study movement. Honorary fellows, not exceeding ten, may be elected by the Council.

ARTICLE III—FEES

There shall be no admission fee. The annual dues shall be one dollar, payable before February first. The official publications of the Society shall be sent without charge to members not in arrears for dues. Members residing outside of the United States shall pay the necessary foreign postage on publications mailed. Honorary fellows shall be exempt from all dues to the Society. The name of any member two years in arrears for annual dues shall be omitted from the list of members, but may be restored by payment of arrearages or by re-election.

ARTICLE IV—OFFICERS

1. The officers shall be a President, five Vice-Presidents, a Secretary-Treasurer, Editor, ten Directors elected by general vote of the Society, and additional Directors elected by branch organizations as provided for in Article VI. The President, Vice-Presidents and Secretary-Treasurer shall constitute an Executive Committee for the transaction of routine business authorized by the Council. All the officers together shall constitute a Council with the following duties: Consider and report to the Society all business proposed for a general vote and manage the business of the Society according to the constitution and by-laws. The term of office for the President and Vice-Presidents shall be one year, for the Secretary-Treasurer and Editor two (or three?) years and for the Directors two years (five of the first Directors shall be elected for one year, and five for two years).

2. Elections of officers. The Council shall make nominations for all offices and publish them in the official journal before Novebber fifteenth of each year. Members and fellows shall have the right to suggest nominations by mail, and any name thus receiving at least fifty votes before October fifteenth shall be published with the nominations by the Council. The annual election shall be held in the last week of December, at a stated meeting if such

is ordered by the Council to be held at that time; otherwise by ballots mailed to the Secretary. Members unable to attend any meeting of the Society shall have the right to mail their ballots to the Secretary. All ballots mailed must reach the Secretary before December twentieth, in order to be counted at the annual election. A majority of the ballots voted by mail and in person shall be sufficient for election.

Any state, city or provincial section of the Society consisting of more than one hundred members may elect a delegate to serve two years as a Director in the Council of the Society.

In case of vacancies the Council shall appoint officers for unexpired terms.

ARTICLE V—OFFICIAL PUBLICATIONS

All official communications approved for publication by the Council shall be published in THE NATURE-STUDY REVIEW, which shall be sent free of charge (except foreign postage) to all members whose annual dues have been paid. This journal shall continue to be published privately and on the personal responsibility, financial and editorial of its editor or editors, unless in time the annual income of the Society justifies the Council in assuming the management and publication as the official organ of the Society. The Secretary-Treasurer of the Society shall, before February first of each year, pay to the editor and publisher the cost (not to exceed eighty cents and foreign postage) of annual subscription for each member whose dues have been paid.

The members of the Council shall serve as an advisory Editorial Committee for THE NATURE-STUDY REVIEW.

ARTICLE VI—BRANCHES OF THE SOCIETY

Members of the Society in any city, state, group of states, or province may, with the approval of the Council, organize branches. Any branch with more than one hundred members may elect a delegate to serve as a Director of the Society for two years.

ARTICLE VII—AMENDMENTS

Amendments to this Constitution recommended by the Council and published in the official journal before June first of any year may be adopted by a two-thirds vote of members voting in person or by mail at the annual election in December.

A CHILD'S REPORT ON A FIELD TRIP

To the Editor of The Nature-Study Review:

I enclose with this an article written by a little eleven-year old girl in one of the ward schools here, after a field trip. It was not done under my directions, but came into my hands because I am interested in the teaching of the subject. Miss Anna Wylie, of Turner St. School, was the teacher who directed the work. It seemed to me a very good illustration of what can be accomplished by field work in the grades, and as you will see it has not been corrected or altered by the teacher.

CENTRAL HIGH SCHOOL
GRAND RAPIDS, MICHIGAN GRACE F. ELLIS.

FOURTH STREET CREEK

By Minnie Oele, Grade 5

Yesterday we went to Fourth St. creek to have an out of doors Geography lesson. We walked over to the creek and I was very tried. Then our teacher told us to sit down and draw the river basin. There were hills on almost every side.

There was one hill that had never been plowed and great sods kept the land forn being washed away after rains. Another hill that had been plowed was filled with gullies. All the hills that send water to the creek and the gullies form a river basin. This little creek and all its branches form a river system.

Right before us was a flood plain which was formed many years ago by floods. One place there were very many springs and some of us got our feet wet. At the place where we were many streams feed the brook.

Over some of the springs the owner had a little house, which we call a spring house, and from these were pipes to the owner's house.

This little creek is carrying the farmer's peach orchard away, day by day. In one place the stream has cut right under a peach tree and it has fallen down.

In a hollow there is a lake and some gullies have been going back farther and farther, and one has backed right into the lake.

In another place where there is a water fall the farmer has put a pipe so that the water will not wash all his land away.

The creek has worn away much soil to quite a depth. There are very many boulders there, too, which the glacier brought here and the creek has uncovered.

In some places there are four or five different layers of soil. There is the black soil, glacial till, clay, and some times another layer of glacial till.

Glacial till is the soil that the glacier brought to us not less than ten thousand years ago. We sometimes call it gravel.

We measured how many cubic ft of water fell over the falls. We found out that 16⅔ or 17 cubic ft of water fell over the falls in one minute. We had a string which was fifty ft. long and straightened it out along the creek. Then some of the boys dropped a chip in to the water and it took just one minute to float fifty feet.

Then we found the average width which was 2 ft., and the average depth which was ⅙ ft. Then we multiplied the length, average depth and average width which gave us the cubic feet of water, ⅙ ft x 2 ft x 50 ft= 16⅔ cubic feet of water.

In on place there was a fall and beneath it the iron had almost painted the creek's walls. Some times when the stream has to turn, it turns with such force that it takes land from one side and throws it to the other side and in this way forms a bay. We saw many terraces. These were made by the water being to different heights.

BOOK REVIEWS

Mosses and Lichens. By Nina L. Marshall. Pp. 315, illustrated. New York, Doubleday, Page & Company, 1907. $4.00.

This book is designed for popular use. However, it is unfortunate that, unlike some of its companion volumes in the same series, it is not valuable for scientific, as well as for popular use. For the scientific purpose the book need not be seriously considered, especially because its author is merely a compiler and not a special student of the difficult groups of plants treated.

A book designed for popular use should be reviewed from the standpoint of the people for whom it is intended. The full-page illustrations are unusually attractive, and constitute the most valuable part of the book. Two different genera of mosses on colored plates IV and XV bear the same name. The numbering of the colored and the black-and-white plates is very confusing and they are scattered through the book with more attention to spacing than to the subject-matter. This would be less annoying if the plates could be found from the index, which is sometimes impossible (e.g., Climacium, Plates IV and XV.) The index itself is very difficult to use: some mosses are arranged alphabetically in the general index only, as Catherinea; others appear only under the index heading of mosses, as Ditrichum; and others, like Bryum, are mentioned in two different parts of the index. The lack of any key or of any group characterizations makes it necessary to read every genus until the right one is reached. Any unfortunate royal-path hunter finding a Hypnum would be forced to read from page 109 to page 298 before striking the genus; if the plant were Hypnum triquetrum twelve more pages would be necessary to find its specific name. That any present-day writer should compile a 315-page book on plants without keys to make its contents available is—to put it mildly—somewhat surprising.

Had Dr. A. C. Grout never published his two books on mosses one could understand Miss Marshall's cry for an "easy path to knowledge." His "Mosses with a Hand-Lens" has the following good points that should recommend it as an "easy path:" clear text, simple keys, distinct and characteristic pictures, convenient form and moderate price.

Teachers College JEAN BROADHURST.
Columbia University.

Evolution and Animal Life. By DAVID STARR JORDAN and VERNON L. KELLOGG. New York: Appleton. 1907. Pp. 489, illustrated. $2.50.

This new volume is an elementary discussion of the facts, processes, laws and theories relating to the life and evolution of animals. In short, it is an introduction to most of the interesting and important problems in the philosophical biology of the present day. It ought to be widely used by general readers and especially by teachers and students of biology.

The Spirit of Nature-Study. By EDWARD F. BIGELOW. New York: Barnes. 1907.

This is a series of readable talks in the style already well known through the author's "How Nature-Study Should be Taught," in many magazine articles, and in the editorial touches given to "Nature and Science for Young Folks," in *St. Nicholas*. Most chapters of the book have no particular bearing on school nature-study, except as contact with nature in the great out-of-doors gives inspiration and suggestion which is needed by every teacher in the schoolroom.

Gray Lady and the Birds. By MABLE OSGOOD WRIGHT. New York: Macmillan. 1907. Pp. 435, 36 full-page illustrations, 12 in color. $1.75.

This new book of bird stories strikes the reader as likely to be interesting to children; but, of course, only time can determine what the children will think of it. In brief this is the story: "Gray Lady," happening into a hillside country school one day in the early fall, makes an alliance with a band of youngsters, to whom each week thereafter she tells a story of the bird year, following their life in migration and their return in the spring.

NATURE-STUDY AND SCIENCE NOTES

[EDITOR'S NOTE. This department will be conducted by Chester A. Mathewson, of the High School of Commerce, New York City. Notes and suggestions may be sent to him in care of the editor of THE REVIEW.]

Plants that Seldom Fruit. The knowledge that the common white potato seldom produces fruit, is so widely diffused that the barrenness of the plant causes no comment. Indeed, since the tubers in a measure function as seeds we have partially transferred the name to them. It is usual to speak of potatoes intended for planting as "seed potatoes." Real potato seeds may be found, however, if one searches the potato-fields long enough, and from such seeds new strains of potatoes may be raised. The potato is not alone in its strange ways. Many other plants, of which the ground-nut and lily-of-the-valley are good examples, rarely produce seeds. It is noticeable that all such plants have other excellent and efficient means of propagation and it may be assumed that finding one method requiring less effort than the other they have gradually adopted it. When plants have more than one means of multiplying, as for instance, seeds above ground and tubers or runners below ground, they usually subserve two distinct uses: those below ground serving to multiply the plant in its own locality, and those above giving it a chance of gaining a foot-hold in distant lands. [*American Botanist.*]

Animals Frozen to Ice. Ernest Thompson-Seton thus comments in the *Ottawa Naturalist* concerning a ruffled grouse, apparently in sound health, found with its tail feathers frozen into the ice crust, under a bush. "In the winter they commonly sleep on the ground, entering snowdrifts only in the coldest weather. It is absolutely certain that its tail could not have been frozen down, had there not been at the place some liquid. This may have been produced by a certain condition of the bird's bowels, or the sun's heat in such a sheltered spot may have melted the snow, so that it was wet when the bird went in, or finally, the bird's tail may have been wet when it went to bed, and a frosty night completed the dilemma.

"This you will remember is an accident of a class which happen every year to the foxes in Alaska. They sit down on the wet ice, thereby casting a shadow over it. In fifteen or twenty minutes the wet in the shadow has congealed, and the fox would be made prisoner but that he tears himself violently away, leaving much of his fur in the ice. The consequence is that in the spring of the year all the blue foxes have their buttocks more or less denuded of fur."

School-Gardens in the District of Columbia. At the last session of Congress an appropriation of $1,000 was made for the purpose of continuing and extending the school-garden work which has been carried on for a number of years in a cooperative way by the public schools and this Department. Beginning four years ago with a few gardens on the Department grounds and a little improvement work around a single school, the movement has grown until this year 700 children have gardens on the Department grounds, 124 school buildings in the District have gardens, and 160,000 packets of seeds have been sold for home gardens. [*Experiment Station Record.*]

Forest Policy in France. France has under way a far-sighted forest policy which will require two centuries before the work reaches its greatest efficiency. The plan covers the reforestation of vast tracts of denuded land and the work is in the hands of 4,000 trained foresters in the pay of the Republic and a large number of men employed by the communal governments.

Nearly a century ago the forests of France were vanishing as are those in the United States today, but the depletion had gone even farther than it has yet gone in America. The French people commenced protecting and restoring the wooded areas and have stuck to the task ever since. The work is slow, but in 200 years the existing damaged forests will be reconstituted, and all the waste spaces will be replanted to the point of proper proportion to insure the conservation of the water supply, and to furnish the timber and wood required by the population.

The area of the National Forests of the United States exceeds twenty-fold the National and communal forests of France, but the problems are the same. France has been longer at the work and when it began its forests were in a worse condition than ours are now, but not worse than our privately owned forests will be if present methods continue. [Notes from a Press Bulletin, U. S. Forest Service.]

Effects of radium on plants. C. S. Gager, of the New York Botanical Gardens, has shown that the rays of radium and other radioactive substances act as a stimulus to germination and growth, and further experiments by the author warrant a similar conclusion with respect to other plant activities, such as respiration, starch making, geotropic response,etc. The growth of plants watered with radioactive water may be accelerated or retarded, the results varying not only with the degree of radioactivity but also with the species of plant employed. When pollen or ovules were exposed before pollination, or when exposure was made after fertilization of the egg, plants growing from the resulting seeds were found to vary profoundly from the parent plants. Whether these variations are capable of transmission is yet to be determined. [*Science.*]

Science and Poetry—a Protest. The advisability of correlating literature and science in the schools was at one time a much-debated educational question. The writer has heard seriously advocated before a state science teachers' association the advantage of always having the zoology class read 'The Chambered Nautilus' when studying the Mollusca,

though assent was withheld by the same speaker from the proposition to have the members of every English literature class dissect a nautilus when studying Holmes's poem. That there is nothing poetical in the bare facts of nature, and that nothing is really interesting unless invested with poetry or fancy, are two ideas that can never, it seems, appear erroneous, except to one who has studied nature at first hand.

Sugar-coating the supposed pills of scientific fact in nature-study literature and teaching has been baneful enough, but when articles in reputable magazines, intended for mature minds, poeticize science to the verge of misrepresentation, it is difficult to know whether to blame the author the more, or regretfully to decide that, after all, the general public is still unable to appreciate natural facts as nature presents them.

A series of three articles in *Harper's Monthly Magazine* for December, 1906, and February and March, 1907, entitled "The Intelligence of the Flowers," by Maurice Maeterlinck, have been the inspiration of this protest.

To say that no flower is "wholly devoid of wisdom;" that, in order to deprive a flower of reason and will, "we must needs resort to very obscure hypotheses;" that it is in the vegetable world that "impatience, the revolt against destiny, are the most vehement and stubborn;" and that the pollination of the eel-grass is "a tragic episode," may be most excellent poetry, and enhance the literary value of an article; may, indeed, for aught we know, be the necessary conclusions of a poet, but to read such statements in cold print congeals the blood of any botanist.

Still we might shiver in charity if interpretations only, and not facts, were open to question. We are told, for example, that the tip of the young stem of a seeding laurel tree, because the seed germinated on a perpendicular rock-wall, "instead of rising towards the sky, bent down over the gulf," notwithstanding its geotropism.

We learn that dodder "voluntarily abandons its roots," and that it will avoid other species and "go some distance, if necessary, in search of the stem of hemp, hop, lucerne or flax."

In the second article we learn, for the first time, that the *flowers* of Drosera and Nepenthes are carnivorous, and that the problem of cross-fertilization is "normally insoluble." Here, also, obsolete terminology is perpetuated in the expression "fertilization of the stigma," and obsolete interpretation in referring to the stigma as the "female organ," and to the stamens as the "male organs" of the flower.

"All that we observe within ourselves," says Maeterlinck, "is rightly open to suspicion; and we are too greatly interested in peopling our world with magnificent illusions and hopes." Perhaps this explains the impossible botany of the articles, but it can not excuse it.

[C. STUART GAGER in *Science*.]

Turpentine Cups. The old plan of cutting deep boxes in the trees, in which turpentine collected after running down the scarified trunks, was universal until a few years ago. It was wasteful and destructive. Trees so mutilated survived only about four years. They might continue to live, and they usually did not fall for years, but their value as turpentine

producers was at an end and their value for lumber was seriously lessened.

Now twenty million turpentine cups are used in the pine forests of the South to catch the flow of resin from the trees, and seven or eight million are added each year. These simple-looking cups, which are not unlike flower pots in size and shape, indicate a rapid and highly important change in the American method of gathering turpentine, due to the need of economy in using all forest products and to the application of science in an old-fashioned industry. [*Press Bulletin of Forest Service.*]

Bird Groups at the American Museum. *Bird Lore* for July—August describes the new bird groups at the American Museum of Natural History, New York. Each group is designed to embody a definite idea. The more novel feature of this idea is to be found in the painted backgrounds which form a part of each group. Painted back-grounds for small groups or panels of mounted birds have long been employed by the taxidermist, but this, it is believed, is the first attempt to introduce backgrounds painted from nature and intended to reproduce a given scene as accurately as the groups they supplement do a limited portion of it. Such backgrounds have, therefore, not only a biologic or ecologic value, as they portray the nesting habit of a species or illustrate colonial nesting habits on a scale which mere taxidermy alone would prohibit, but they have also a botanic, geographic and physiographic value. It is believed, therefore, that when the thirty-odd groups which have been planned for this series are completed, the Museum will have not alone adequate reproductions of the nesting habits and haunts of many American birds, but will have also a series of paintings representing in a novel and attractive manner characteristic American scenery. This series might indeed be called America and its Bird Life.

The Disappearance of the Passenger Pigeon in Ontario dates back at least forty years, though as late as 1870 some of the old roosts were still frequented, but the incredible flocks, of which so much has been said, had gone long before that date, and by 1880 the pigeon was practically exterminated, not only in Ontario, but over the greater part of its old range. There are, however, occasional records of birds taken for some years later. I was in New York in the latter part of November 1892 and was then assured by Mr. Rowland, a well known taxidermist, that he had recently seen several barrels of pigeons that had been condemned as unfit for food. They had come to New York from the Indian Territory. Mr. Wm. Brewster has recorded the sending of several hundred dozens of pigeons to the Boston market in December of the same year, and in January, 1893; these were also from Indian Territory. These are the last records we have of the passenger pigeon as any thing more than a casual migrant. The records ceased after this till 1898 when three birds were taken at points widely apart, an adult male at Lake Winnipegosis, Man., an immature male at Owensboro, Kentucky, now in the Smithsonian Institution and another immature bird taken at Detroit, Michigan, is in my collection. These are the last records that can be based on specimens.

The birds were seen wild as late as 1900; but for all practical purposes

the close of the nineteenth century saw the final extinction of the passenger pigeon in a wild state and there remained only the small flock, numbering in 1903 not more than a dozen, that had been bred in captivity by Professor C. O. Whitman of Chicago. These birds the descendants of a single pair, had long before that ceased to breed and it was in an effort to obtain fresh blood for this flock that I started a newspaper enquiry that brought many replies none of which could be substantiated as records of the passenger pigeon and many referred to the mourning dove. I am aware that there has been lately widely spread and persistent rumors of the return of the pigeons, but no rumor has borne investigation, and I feel that Professor Whitman's small flock now reduced in 1906 to five birds are the last representatives of a species around whose disappearance mystery and fable will always gather.

[J. H. FLEMING in *Ottawa Naturalist*, March, 1907.]

Pollination in Evening Primrose. The common evening primrose (Oenothera biennis) has an elaborate arrangement for cross-pollination, including odor, nectar, color and the ripening of stamen and stigma at different times as well as a difference in position of stamen and carpel, and yet De Vries finds in some specimens that the stamens pollinate the stigmas in the bud and the corollas may even fall off without expanding. All the odor, color, nectar, etc., of such flowers is superfluous and goes to waste. Just as we have figured out how the flower acts, it acts differently!

[*American Botanist.*]

Edible Ferns. An evergreen tree-fern in the Pacific Isles is a common article of food with the natives. The roots and the lower parts of the stem are soft and pulpy and have a pleasant smell and taste, so that the medulla of this fern, which abounds in a reddish glutinous juice, is nearly as good as sago. The silver tree-fern, a beautiful species from New Zealand, is said to be eaten in the same way. [*American Botanist.*]

Optimism in Study of Nature. That the study of nature may help us in our pursuit of happiness is suggested by the first line of the preface in Weismann's latest and probably last book on evolution theories. It reads in the translation: "When a lifetime of pleasant labor is drawing to a close—."

Nature-Study in South Africa. The *African Monthly* for May, 1907, contains a strong plea for the introduction of nature-study into the South African schools. The author, Professor Duerden, gives as his aim the investigation of how animals do things and how they come to be what they are; further, a training in how to collect the facts methodically, and then to utilize and interpret them on biological principles. To us in this country these aims seem rather ponderous. As subjects of study Professor Duerden cites the habits and instincts of monkeys, smaller antelopes, moles, native rats, mice, birds, lizards, tortoises, frogs and toads, fresh-water fishes, insects, crabs, spiders, centipedes, millipedes, snails, slugs and worms.

Qualifications necessary for teaching Agriculture in Common Schools. C. A. McNabb in an address before the Teachers' County Institute at

Oklahoma City, took the position that while the teachers will not be expected to teach the practice of agriculture, they should be familiar with this side of the question and should also inform themselves on the work of the U. S. Department of Agriculture, the experiment stations, and the agricultural colleges. They should be up to date in their ideas of farm methods, improved implements, etc. To secure this training he recommends that they read farm journals and the publications of this Department and the experiment stations. [*Experiment Station Record.*]

LIST OF NEW BOOKS RECEIVED

Evolution and Animal Life. By DAVID STARR JORDAN & VERNON LYMAN KELLOGG. "An elementary discussion of facts, processes, laws and theories relating to the life and evolution of animals." Pp. 489, illustrated. New York: **Appleton & Co.** 1907. $2.50.

Elements of Biology. By GEORGE WILLIAM HUNTER. A practical text-book for high schools, correlating botany, zoology, and human physiology. Pp. 445, illustrated. New York: **American Book Co.** 1907. $1.50.

Darwinism To-Day. By VERNON L. KELLOGG. "A discussion of present-day scientific criticism of the Darwinian Selection Theories, together with a brief account of the principal other proposed auxiliary and alternative theories of species-forming." Pp. 403. New York: **Holt & Co.** 1907.

Walking: a Fine Art. By EDWARD F. BIGELOW. "As practiced by naturalists and explained by original contributions to this volume and by quotations from the published works of those who love to dally along country lanes." Pp. 164, illustrated. Salem, Mass.: **Cassino & Son.** 1907.

The Spirit of Nature-Study. By EDWARD F. BIGELOW. "A book of social suggestion and sympathy for all who love or teach nature." Pp. 222, illustrated. New York: **Barnes & Co.** 1907.

Mosses and Lichens. By NINA L. MARSHALL. A popular guide to the identification and study of our commoner mosses and lichens, their uses, and methods of preserving. Pp. 327, illustrated. New York: **Doubleday, Page & Co.** 1907. $4.00.

Stories Retold from St. Nicholas. Six new volumes: Sea Stories, Island Stories, Stories of the Great Lakes, Strange Sights, Southern Stories, Western Frontier Stories. New York: **Century Co.** 1907. Each 200 pages, illustrated. 65 cents.

Gray Lady and the Birds. By MABLE OSGOOD WRIGHT. Stories of the birds for home and school. New York: **Macmillan Co.** 1907. Pp. 435, 48 full-page illustrations. $1.75.

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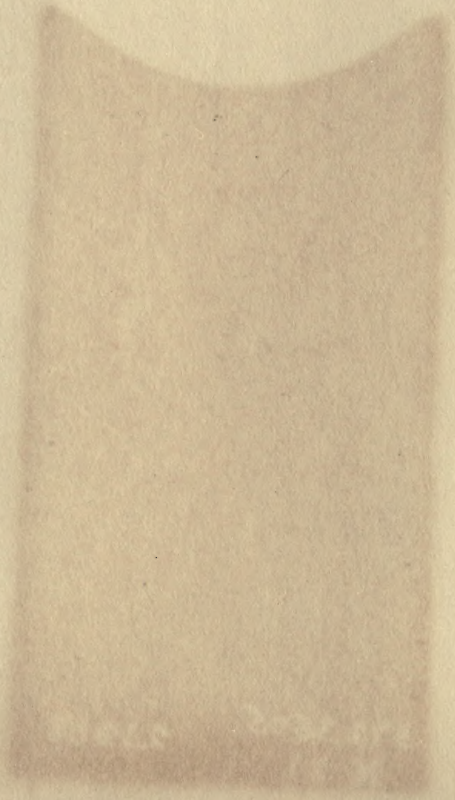

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